THE PROCEEDINGS

OF THE

ROYAL ENTOMOLOGICAL SOCIETY OF LONDON

VOL. VIII. 1933.

Wednesday, February 1st, 1933.

Prof. E. B. POULTON, F.R.S., President, in the Chair.

Vice-Presidents.

The PRESIDENT announced that he had nominated Dr. H. ELTRINGHAM, F.R.S., Dr. K. JORDAN, F.R.S., and Mr. R. W. LLOYD, as Vice-Presidents for the year.

Exhibits.

The SECRETARY read the following letter from Dr. G. Horváth, an Honorary Fellow of the Society :—

" Referring to the notice by Dr. L. G. Higgins (*Proc. Ent. Soc. Lond.*, **7**: 53), I am pleased to inform you that the library of the Zoological Department of the Hungarian National Museum, Budapest, also possesses a complete copy of ' SCOPOLI, Entomologia Carniolica, 1763,' including 43 plates. This copy thus seems to be the fourth one known that contains a complete set of the plates."

Dr. K. JORDAN stated that a fifth copy was in Lord Rothschild's Library at the Zoological Museum, Tring.

The development of the thoracic stink-glands in Heteroptera.

Mrs. M. D. BRINDLEY said :—" Locy (*Amer. Nat.*, **1884**) stated that the giant water-bug, *Belostoma*, in the adult condition possessed two thoracic stink-glands which emit a smell like that of ripe bananas. This is the only account of the odoriferous apparatus of the BELOSTOMATIDAE which has been given. Last summer, through the kindness of Prof. Hungerford of the University of Kansas, U.S.A., I was able to examine some specimens of *Belostoma fluvineum*, Say. The odoriferous glands appear to be completely lacking, and it is possible that Locy mistook part of the salivary apparatus for the thoracic stink-glands. The salivary apparatus of *Belostoma* consists of a pair of enormous acinate glands and behind them a pair of slender tubular glands whose ducts enter the larger bodies close to the anterior

end. These tubular glands are each flexed, and in the flexure lies a small membranous expansion or reservoir. The tubular glands are easily broken off in dissection, and might then be mistaken for independent structures. Prof. Hungerford tells me that he has never noticed a smell like bananas in this insect, but that he 'once opened a bag containing many living *Benacus* and *Lethoceros*, and there was a strong fishy odour connected with them.' This odour may have arisen from the anal excretions, as is said to be the case sometimes with *Notonecta*. The absence of a stink-apparatus is thus an additional character in common between Belostomatidae and Nepidae.

"In the family Lygaeidae, the stink-apparatus of *Scolopostethus* (Pachymerina) and *Nysius* (Lygaeina) is very similar to that of the Capsidae, and is quite distinct from that of the Pyrrhocoridae. In the latter, the reservoir is transversely expanded and dumb-bell-shaped, with a narrow median part and two lateral bulbous expansions, each of which on the posterior wall contains a lens-shaped accessory gland. In the Capsidae the reservoir is oblong and extended in the long axis of the body, and there is no accessory gland. However, in the Lygaeid *Chilacis typhae* (Artheneina) the reservoir, though not dumb-bell-shaped, is transversely extended, and there are two well-marked accessory glands in the posterior wall. Thus in this character the Artheneina are intermediate between the Lygaeidae and Pyrrhocoridae. It is interesting to notice that in this sub-family (as in Pyrrhocoridae) the abdominal stigmata are situated ventrally, and not on the connexivium as is the case in Lygaeina. The ventral aspect of the abdominal stigmata is usually considered to be a primitive character, and probably so also is the possession of an accessory gland to the reservoir of the stink-apparatus. However, that there is any regular correlation between the two is negatived by the condition in *Scolopostethus* where some of the stigmata are also situated ventrally."

A female of *Pterophorus pentadactylus*, L., in cop. with the body of a male.

Dr. E. A. Cockayne said the specimen exhibited was seen by Mr. H. Worsley Wood and himself fluttering amongst the sedge in Wicken Fen on July 9th, 1932, and when captured the body of the male was still soft. Other records of the kind appear in 1929, *Proc. Ent. Soc. Lond.*, **4**: 7, 8 and 79.

A note on the larva of *Aspilates gilvaria*.

Dr. E. A. Cockayne said:—"In June 1932 Mr. C. N. Hawkins and I found about three dozen larvae of *Aspilates gilvaria* on the Surrey downs. They were rather high up on dead grass above their food-plant, *Lotus corniculatus*, resting stretched straight out along the stems. They were very easily disturbed and curled themselves up at once into a close coil, sometimes remaining on the grass stem, but more often falling down into the short herbage below. I was deceived a good many times into thinking that a snail was a larva of *gilvaria* and once or twice made the opposite mistake, but this seldom happened owing to the movement of the larva. Two forms of larva were found, an ochreous one, which was much the commoner, and a bluish-grey one with, or without, darker markings.

"I took home a sod with *Lotus* and dead grass and planted it in a pot so that

I could watch the behaviour of the larvae, and confirmed the fact that they habitually rest stretched out along a grass stem or less often with the legs on one stem and the prolegs on another. They do not appear to attach themselves by a silk thread. They feed at night."

A third brood of *Colias croceus*.

Mr. H. M. EDELSTEN exhibited a number of *Colias croceus* which had been bred from ova laid by a ♀ taken on the South Downs at the end of August 1932. The ♀♀ had the yellow markings in the black border of the fore-wings very faintly developed, in some specimens they had practically disappeared. On the underside in both sexes the outer row of spots was continued right round both wings and intensified. The specimens emerged in a warm room between Nov. 1st and 30th. Neither of the parents, which were taken *in copula*, had the heavily marked undersides of their progeny.

Observations on two Jamaican Nymphaline butterflies—*Lucinia cadma*, Drury, and its model *Dynamine* (*Eubagis*) *egaea*, F. (*zetes*, Mén.) by Miss Lilly Perkins.

The PRESIDENT said that he had been much interested in Mr. W. J. Kaye's exhibit * of these two Nymphaline butterflies and his conclusion,—which could hardly be doubted by anyone who compared the colours and patterns,—that, on the under surface, *L. cadma* was mimetic of *D. egaea*. The resemblance was so interesting that he was anxious to learn something of the habits of the two insects and how far they were associated in life. He had therefore written to Miss Perkins, who had taken the specimens exhibited by Mr. Kaye, and had received the following very interesting notes kindly written by her :—

NOTES ON *LUCINIA CADMA* AND *DYNAMINE ZETES*.

With regard to the distribution of *L. cadma* and *D. zetes* in other parts of the island I can say nothing, as my collecting has been chiefly confined, over a period of years, to a certain area of the parish of Trelawny—more particularly to that portion of a property named " Baron Hill " which is situated at an elevation of nearly 1200 feet above sea-level, not far from the north coast of the island.

There is a slight rising of the land to the east of " Baron Hill " house, and this is covered with scrubby growth—chiefly young logwood trees intermixed with other wild plants, the names of which I do not know, but which seem in no way different from the vegetation characteristic of that part of the country. The highest part of this rising, not more than an eighth of an acre in extent, is the best butterfly collecting ground I have ever come across, both for numbers of specimens and diversity of species, and one very rarely visits this spot without satisfactory results. P. H. Gosse in his *Naturalist's Sojourn In Jamaica* describes a similar spot near Bluefields, which was a splendid locality for general collecting, with no difference in vegetation, etc., to account for it.

It is on the little hill above mentioned that *L. cadma* is more plentiful than anywhere else that I know. It does not occur in great numbers at any time, but during the summer one may see from two to five specimens there on most

* 1932, *Proc. Ent. Soc. Lond.*, **7**: 1; see also *ibid.*, 1931, *Trans.* **79**: 532.

days, and in the same spot I have taken occasional specimens in every month of the year. I have also taken specimens now and then in the surrounding area, but not often.

D. zetes, on the other hand, does not much frequent the top of the little hill, although I have taken it there. It prefers the lower slopes, not a stone's throw from the haunt of *L. cadma*, and is more widely distributed about the adjacent countryside. There is, however, a neighbouring hill-top where I have occasionally taken a few specimens of both *cadma* and *zetes*.

The only other part of the island where I have come across *L. cadma* is in the Claremont district of St. Ann, where two flew into the house of a friend, on different days during September 1929, and were taken on the window-panes, and in September of this year I saw *D. zetes* in the same district at an elevation of about 1500 feet.

In looking through some old diaries I find that in 1929 I took both species together in the same locality at " Baron Hill " on the following dates :—30 Jan.; 12 Feb.; 29 May; 12, 17, 21 June; 9 Sept.; and in 1930 on 27 April; 27 May; 11 June; 4, 7 July; 27 Aug.

Doubtless there were other dates when I took both in the same locality, but I was not thinking of them in any relation to each other at the time, and it was just by chance that I made the notes.

Both *cadma* and *zetes* settle on the upper surfaces of leaves with their heads downwards or outwards and their wings folded over their backs. I think that I have seen *zetes* also settle on the underside of a leaf, but of this I cannot now be certain, and in any case this is not its usual behaviour.

L. cadma is much easier of approach than *D. zetes*. It leaves its perch at intervals and darts about, almost invariably returning to the same spot, and is quite easily taken.

A specimen which I once captured was removed from the net and examined, holding it gently between the fingers. Finding that it had a damaged wing, I released it, when it immediately returned to the leaf from which I had swept it, as if nothing had happened.

D. zetes, on the other hand, seems to have keener sight and is more difficult to approach. It has a more erratic flight, and though often returning to settle on the same bush or a near-by one, does not, so far as I have noticed, select the same leaf, and when scared will leave the locality altogether.

Now and then I have seen a number of *zetes*, probably about two dozen, together, consisting of both male and female insects.

Although they generally favour low bushes, yet I have seen them flitting in the branches of Fustic and Spanish Elm trees, and one morning shortly after sunrise, I saw a goodly number darting back and forth in the very top of a Fustic tree some 18 or 20 feet high. I have only noticed these gatherings in the mornings. Is it possible that *D. zetes* congregate together to sleep in the same manner as *H. charithonia*, L.?

L. cadma as a rule settles at a height of about 6 to 9 feet, and does not seem to fly to any great height.

I have noticed bits nicked out of the wings of *cadma* as if by a bird, but have never noticed this with *zetes*.

Cadma occurs in every month from January to December and I have taken

zetes from February to December, and it is quite possible that it occurs in January also, and that I may have overlooked it.

The larva of *cadma* is still unknown, although there is a showy-looking caterpillar found in its haunts which might possibly be the right one, but I have so far failed to rear it. It is slightly hairy, about an inch long and banded alternately cream and dark red, the head, the foremost and hindmost bands being bright crimson. The dark red bands are studded with metallic blue tubercles. The first specimen I found was on the plant locally known as "nightshade" (which is, I believe, *Echites suberecta*), and I offered it the leaves on which it was found, but it would not eat and soon died.

Subsequently, caterpillars were found crawling aimlessly on the ground or on other bushes, and though I experimented with everything I could think of, I failed with these also. Then last year one was found eating the green seed-pod of the "nightshade," and I hoped to rear it, but the pod dried rapidly, and though I searched far and wide, all the other available pods were also dried up, so once again I failed. These caterpillars are rarely seen, but now that I definitely know their food, I hope, at some future time, to rear one and decide the matter.

I am inclined to think that *D. zetes* lays on "cow itch," a sort of stinging-nettle. I once saw a female moving about this plant as if she were laying eggs, but I was not near enough to locate the exact spot, and on closer examination could not see anything, as I had no lens with me, and one may not handle the plant with impunity.

LILLY PERKINS : 13 *December*, 1932.

Feeling a little uncertain about the relative abundance of the two species, but believing that the *Lucinia* was the rarer, he had again written to Miss Perkins who had kindly replied :—"*D. zetes* is commoner than *L. cadma*, taking the whole island into consideration, though so far as I know, it is really never a common butterfly anywhere."

There was extreme sexual dimorphism on the upper surface of *Dynamine* but the under surfaces of male and female were similar, as also were both surfaces of the male and female *Lucinia* although the latter was larger and paler on the upper.

The *Lucinia* was bolder and less wary and more often bore evidence of attack. It was commoner at any rate in one locality, although on the whole rarer. There was some indication that the *Dynamine* may collect in sleeping assemblages.

The under surface resemblance, with the similar habits and method of display, left no doubt about the mimetic association and it appeared certain that the *Dynamine* is the model. Some of Miss Perkins' observations, briefly summarised above, suggest that the resemblance may be Müllerian rather than Batesian, but experiments and further observations were required. Allied species or races of *Lucinia*, also similarly mimetic of *Dynamine*, were found in other West Indian islands—*L. torrebia*, Mén., in Hayti, and *L. sida*, Hübn. (*culvana*, Fruhst.), in Cuba. An additional reason for the confident belief that *Dynamine* is the model was to be found in the fact that it is a large and important genus with many species widespread over tropical America, contrasting sharply with the restricted island species or races of *Lucinia*.

He desired to thank Miss Perkins for her most interesting observations and for her kindness in giving him the opportunity of studying the females of *L. cadma*

which he had not seen before; also to congratulate Mr. Kaye on this notable addition to the mimetic associations between the Nymphaline butterflies of the Neotropical Region.

A note on the capture, by a Wood-swallow, of a *Papilio ulysses*, L., with flight weakened by damp wings.

The PRESIDENT communicated the following note by his friend Dr. G. D. Hale Carpenter who was unable to be present :—

E. J. Banfield, who settled on a small island between the east coast of Queensland and the reef, records that *Papilio ulysses* " is one of the few among gaily painted butterflies that certain birds like and hawk for. When in full flight, by swift swerves and doubles, he generally manages to evade his enemies. . . ."

Banfield found and rescued one of these butterflies floating alive on the sea. It flew with difficulty towards an islet, rising " higher and higher in lurching spirals, and having gained the necessary elevation, swooped superbly for the sanctuary of the tree-lined beach. . . . At that moment ironic Fate flashed out in the guise of a twittering wood-swallow. In the last stages of exhaustion no evading swerve was possible. Two blue wings on the snow-white coral marked where the wanderings of Ulysses had ended. . . ." *

The four male and eight female *Pyrameis cardui*, L., captured migrating at midnight in the Atlantic eighty-seven miles from land, by Sir Donald Kingdon.

The PRESIDENT exhibited these twelve specimens, referred to in 1932, *Proc. Ent. Soc. Lond.*, **7** : 56, 57, 106, and said that he hoped his friend Dr. C. B. Williams would be able to determine the developmental condition of the ova in the females.

Twelve out of fifty-nine migrating *Libythea labdaca*, Westw., taken in one sweep of the net by Miss Vinall, on 22nd August, 1932, Bongandanga, Belgian Congo.

The PRESIDENT said he had received 17 specimens,—15 male, and 2 female—from the great catch made by Miss Vinall, and of these he had brought 12 for exhibition. The accompanying note recorded—" Migration of *Libythea* from Aug. 15 until a few appearing on Aug. 25." An earlier 1932 migration was described in the following extract from Miss Vinall's letter of 24 July :—" I made a note in my diary of another migration of *Libythea* on April 21, 22 and 23, but I have no notes as to their flight; neither did I take any specimens, but they were all around us in very large numbers."

It was satisfactory that Miss Vinall had now witnessed the migration of this butterfly which she had not observed a few years ago, as mentioned in her letter of 22 August, 1928 (1928, *Proc. Ent. Soc. Lond.*, **3** : 71). It was to be hoped that Miss Vinall may be able to record the direction of the earlier and later flights and determine how far they correspond with those described by C. O. Farquharson in S. Nigeria, viz. a southward flight early in the rains and a northward one towards the end, when " One may conclude that the rains are over. Between the flights to and from the forest belt we never see these butterflies " (1922, *Trans. Ent. Soc. Lond.*, **1921** : 404–05).

* From *My Tropic Isle*, 1923 ed., p. 106 (first publd. 1911).

A wasp's nest suspended from an electric light bulb, observed by H. L. Guppy in Trinidad. Bats pursuing insects attracted to light.

The PRESIDENT exhibited two examples of a wasp sent by his friend Mr. Guppy and referred to in the following notes; also his drawing of the bulb and pendent nest. The wasp had been determined by his friend Mr. R. B. Benson, as *Megacanthopus* sp., near *indeterminabilis*, Sauss.

"1932, *December* 12.—I enclose sketch with specimens of a small wasp which often builds its nests in and around dwellings. They appear to work in pairs, only seeming to complete a small paper nest with hexagonal cells. They choose some extraordinary situations for their nests, inside and outside the dwellings in this locality, but this is the first time I have seen a nest hanging from the lower end of an electric bulb. The shade is pale green and about 8 inches in diameter: the light is fixed at the front entrance to this hotel [Hotel Monaco, Nook Avenue, St. Ann's, Port-of-Spain] and is lit every evening from 6 to 10 p.m. One wasp is always on duty, apparently motionless except when the numerous small moths flying around the light collide with it in their mad career around the bulb, and then it merely twitches its body as if annoyed at the clumsy fliers. The wasp never leaves its perch on the nest, nor does it appear to suffer any ill effects from the blinding glare of the light, nor from the lack of rest caused by the moths dashing around it. This wasp, I think, is fond of over-ripe fruit, as it is sometimes seen on fallen fruit on the ground

"Bats have learnt to use the street lamps to get their food with a minimum of toil. Every night they may be seen flying around the lamps, chasing and catching insects. The brilliant light does not seem to dazzle their eyes, as it would ours. The globes are not in all cases made of frosted glass but are often quite plain so that there is nothing to soften the light. Bats also occasionally fly into brilliantly lit rooms in chase of nocturnal insects. We have a blood-sucker which in some localities attacks animals in stables at night, and, strange to say, if there is a light burning it keeps this species away. Human beings are occasionally bitten in certain localities by this bat (*Desmodus rufus*)."

The hatching organ of *Lipeurus columbae*, Linn.

Dr. WIGGLESWORTH recalled that at a previous meeting he had described the hatching spines observed by Miss E. K. Sikes and himself in various Siphunculata and that these organs were quite unlike any that had been observed in other insects. In view of the disputed relationship between the Siphunculata and the Mallophaga it was of interest to examine the hatching organs of the latter; for it was well known that related insects frequently had hatching spines of like form. The hatching organ had been observed in the pigeon louse, *Lipeurus columbae*, and proved to be very similar to that of the sucking lice. According to Nuttall the whole trend of recent research supports the opinion of the earlier authors in placing the Mallophaga and Siphunculata close together in the system. The form of the hatching spines affords further support for this view.

The hatching organ of *Lipeurus* is described and figured in 1932, *Parasitology*, **24**: 365.

Peculiar secondary sexual organs in Anthribids.

Dr. KARL JORDAN, F.R.S., exhibited three species of a new genus of ANTHRIBIDAE from the Fiji Islands which differed from each other in the structure of the hind legs of the males to a very remarkable extent. The species were otherwise very similar, proving that secondary sexual characters should be used with great discrimination in the erection of new genera.

Dr. Jordan also showed drawings of the very peculiar head of the Anthribid genus *Adoxastia* from Java (cf. 1931, *Nov. Zool.*, **36** : 299).

A new species of *Callidryas*.

Dr. F. A. DIXEY exhibited a specimen of a new *Callidryas*, with an example of *C. eubule*, Linn., for comparison. He said :

" Among the butterflies collected by the late Admiral Edmund Bourke at Guayaquil and Puna Island, Ecuador, in August 1882 and February 1883, there are five male specimens of a form of *Callidryas* which appears to be undescribed. This form bears some resemblance to the well-known *Callidryas eubule*, L. (otherwise *C. sennae*, L.) but differs from it in several particulars.

" 1. The upperside of the male of *C. eubule* is uniformly of a brilliant lemon yellow. The upperside of the present form is cream-coloured, lightly tinged over the hind-wing and basal third of the fore-wing with pale fawn-colour.

" 2. The male of *C. eubule* is nearly always without any indication on the upperside of the fore-wing of a disco-cellular spot; only in a very few specimens a minute dark point may be seen on the lower disco-cellular venule. In all five of Admiral Bourke's specimens, there is a well-marked though small dark spot in this situation.

" 3. A more distinctive character than the foregoing is the distribution of the raised scales on the upperside of both fore- and hind-wing. In *C. eubule* these occupy the whole of the interspaces between the costal vein and the upper radial of the fore-wing, nearly half of the lower radial, and a proportion diminishing from apex to anal angle in the remaining interspaces of the hind border; they do not enter the cell. In the hind-wing they furnish a narrow border to all the interspaces of the hind margin. Their distribution in the present form is much more extensive; quite two-thirds of the cell are occupied by the raised scales, and of the general surface of the fore-wing every interspace is taken up by them except a small portion, adjacent to the cell, of the second and the greater part of the first median. The border of raised scales on the hind-wing is much broader than in *C. eubule*.

" The markings of the under surface in these five examples correspond with those of *C. eubule*, but the pearly spots in the centre of the hind-wing are perhaps less perfectly in line with the submarginal streak of the subcostal interspace, forming with that streak a widely open angle. The ground-colour of the underside is pale fawn, and in these specimens is without the irroration frequently to be seen on the underside of the male *C. eubule*. The overlap of the hind-wings is, as in that species, white.

" The characters mentioned, and especially the third one, appear to entitle this form to specific rank. I propose to name it *Callidryas bourkei* after its captor, whose activities as an assiduous collector in most parts of the world extended over at least 55 years.

" The exact locality of these specimens is not recorded. Puna Island is 40 miles south-west of Guayaquil.

" A description of the type specimen is as follows :

" Callidryas bourkei, sp. n.

" ♂. Exp. al. 60 mm. Upperside cream-coloured, lightly tinged over the hind-wing and basal third of the fore-wing with pale yellowish fawn colour; a small, well-marked dark brownish-red spot on the lower discocellular venule; an area of raised scales occupying the apical two-thirds of the fore-wing, including a similar proportion of the cell, and a broad patch at the anal angle; also forming a moderately broad border to the hind-wing. The underside of both wings, except for the overlap on the fore-wing (which is white), a pale fawn, in the type without irrorations; reddish markings similar to those of *C. eubule*, but in the centre of the hind-wing somewhat less regularly disposed.

" Coast region of Ecuador.

" Type and paratypes in Hope Collection at Oxford."

Wednesday, March 1st, 1933.

Prof. E. B. Poulton, F.R.S., President, in the Chair.

Election of Fellow.

The following was elected a Fellow of the Society :—Boris Jobling, The Wellcome Bureau of Scientific Research, 183–193, Euston Road, N.W.1.

Obituary.

The death of Mr. Alan Druitt, a Fellow of the Society, was announced.

Exhibits.

Further note on cells, made by bees, from a torrent-bed in Central Arabia.

The Secretary on behalf of Dr. H. Scott read the following : " The publication (1932, *Proc. Ent. Soc. Lond.*, **7 :** 46–48) of the description and photographs of these objects has brought information as to the identity of the makers of the cells. The Hymenoptera concerned are bees, but there can now hardly be any doubt that they are a species of *Nomia*, not *Chalicodoma*, as was suggested. Dr. H. Bischoff has called my attention to a paper by A. Gutbier entitled ' Über einige Hymenopterennester aus Turkestan ' (1914, *Z. wiss. InsektBiol.*, **10 :** 339–345), containing a description and photographs of the cells of *Nomia ruficornis*, Spin.* These resemble the cells from central Arabia so closely as to render it highly probable that *N. ruficornis* is the actual species in question. Dr. F. Maidl, to whom, at his own request, I have since submitted some blocks of the cells, is of the same opinion.

" Gutbier traces the evolution of these cell-masses. Recalling the observations of Ferton (1909, *Ann. Soc. ent. Fr.*, **78 :** 401–403) on *Nomia diversipes*, Latr., in France (Basses-Alpes), he considers that the latter species exhibits the simplest type of nest-construction in this genus; a single female excavates a burrow, at

* Gutbier's account is recapitulated by Bischoff, 1927, *Biologie der Hymenopteren*, Chap. vi, p. 225.

the end of which are several regularly ovoid cells of the same height; their earthen walls are hardened by salivary fluid, and they are also lined with a delicate pellicle of hardened salivary secretion, like that constructed by more lowly genera (*Prosopis*, *Colletes*, etc.), but dispensed with by those in which specialisation, and with it nest-construction, has progressed further.

"In *Nomia ruficornis* the females nest in colonies. Several use the same entrance-burrow, from which subsidiary tunnels, each leading to a cell, branch. The cells are all at the same level, and are held together owing to their walls being impregnated with the salivary secretion. The subsequent construction of a labyrinth of cross-tunnels round them has the effect of partially sundering the cell-masses from the substratum, to which they remain connected by little supporting pillars. A single nest may consist of several larger and smaller cell-masses, connected by passages. Gutbier likens the cell-masses ('*Nestkerne*'), when pulled away from the substratum, to lumps of coral, and states that they may be round, egg-shaped, cylindrical, etc. His description throws no light on the means by which the upper part of the cells in the Arabian specimens was worn away, leaving a cross-section of the cells exposed, but his photograph of an artificial section of a cell-mass bears a striking resemblance to the Arabian examples."

A subspecies of *Malachius marginellus*.

Mr. DONISTHORPE exhibited specimens of *Malachius marginellus*, Ol., and the recently described subspecies *angustimarginalis*, Donis. He pointed out the differences in the two forms and said that a most interesting point in connection with them was that the typical form with the broad coloured borders to the thorax appeared to be almost entirely found inland, whereas the form with the narrow borders was confined to the coast.

He also showed specimens of *Malachius bipustulatus*, L., ab. *immaculicollis*, Muls. & Rey, from Windsor Forest, an aberration that he had recently added to the British list. A full account of these insects is published in 1933, *Ent. Mon. Mag.*, **69**: 25–27.

Red hind-winged species of Chrysomelid beetles observed by T. Bainbrigge Fletcher in the south of France.

The PRESIDENT said that he had received some examples of these beetles with the accompanying note written from Hyères, 20 October, 1932, by his friend Prof. T. Bainbrigge Fletcher :—

"I enclose some Chrysomelid Beetles with red wings, presumably a warning colour to make them more conspicuous when flying. It is probably well known, but I do not remember having come across a beetle with coloured wings like this, so send them along in case they may be of interest to you."

Prof. T. Bainbrigge Fletcher's observations were continued through November and December, the beetles becoming gradually scarcer, more sluggish, and finally disappearing as the season advanced. Altogether six species, kindly determined by Mr. H. Donisthorpe and Prof. S. Maulik, were observed, one or more examples of each being exhibited to the meeting. The pink colour of wings was very striking and would certainly produce a conspicuous effect in flight, as Prof. Fletcher suggests. His interesting notes on the species are recorded below.

On the morning of 8 October, 1932, when collecting at Hyères, I saw, flying, a Chrysomelid beetle which seemed to have red hind-wings, so netted and examined it and found that the hind-wings *were* red. Its flight was rather slow and the red wings were conspicuous when flying. I kept a look-out on this and subsequent days but saw no more on the wing. However, the observation led me to examine other Chrysomelid beetles sitting on plants and I found that several species have red hind-wings. So far, I have noted six species :—

1. *Chrysolina* (*Chrysomela*) *hyperici*, Forst.—A medium-sized blue-black beetle. This is the one found flying as described above, and the only example of the species that I have seen.

2. *C. grossa*, F.—A larger species, dark-blue with red elytra. Common on a wild thyme—generally several on one plant.

3. *C. graminis*, L.—A still larger species, shining green (sometimes coppery-green), also common on the same plant as *grossa* and generally several on one plant.

4. *C. banksi*, F.—A larger coppery-brown species, found on the same plant as *grossa*, but not so common. On December 7, one found on the road near the Botanical Garden : no wild thyme in the vicinity.

5. *C. americana*, L.—A small purplish-copper species with punctured green stripes on elytra, found fairly commonly at San Salvadour (near Hyères) on *Rosmarinus officinalis*, L., and at Hyères on *Lavandula stoechas*, L. Those found on wild thyme were probably stragglers. Odd specimens were similarly found on *Pinus*.

6. *C. fuliginosa*, Ol.—A single specimen of this large dark species was found on a wall at San Salvadour, December 7.

Many coppery-brown larvae are found on the wild thyme, and *C. grossa*, at any rate, lays its large yellow eggs in batches on this food-plant.

All the species except *C. hyperici* (the one taken flying) are naturally rather sluggish, found clinging to stems of their food-plants or crawling slowly over the leaves. When touched, they drop to the ground. *C. grossa* is conspicuous, *graminis* less so but easily seen; *banksi* is decidedly inconspicuous on its food-plant; *americana*, being smaller, is not very conspicuous and generally found singly on stems of its food-plant and more or less hidden by leaves.

I have tried to induce these four species to fly by throwing them up in the air; but, as soon as they are touched, they sham dead and, when thrown up, drop to the ground without opening their wings. I have also tried dropping them out of the window of my room (about 35–40 feet to the ground), with similar results. I also placed a number of them on a table in order to observe whether they would open their wings when they came to the edge and were about to fall off, but they clung to the edge and refused to fall. When placed on their backs on a smooth surface, they lie and kick for a long time before trying to turn over by opening their wings. In this effort *C. americana* is quite successful and also opens its wings more readily than the others; but the other three species are too heavy-bodied to be able to turn themselves over even by opening their wings.

I put some of the food-plant in water and placed a number of species *grossa* and *graminis* on it to see if they would fly off voluntarily. Most of them dropped off in a short time and wandered about the room, but some remained on the plant

for five days. I also tried warming the room to a temperature above that normal at the time. This made the beetles on the plant more lively; but, although they crawled to the tops of the branches and looked around for further foothold, they did not attempt to fly.

You will see that I have no direct evidence regarding the flight of any species except *hyperici*, but have no doubt that they do fly at times, as the wings are well-developed * and the beetles can readily expand and refold them.

T. Bainbrigge Fletcher.

Prof. Maulik who has studied the Chrysomelidae so extensively had kindly written:—"The occurrence of pink in the hind-wings is not uncommon in *Chrysolina*. Besides these species from the South of France, *Chrysolina coelestina*, Baly, a widely distributed species in the Himalayan region, and *Chrysolina opulenta*, Reiche, a species which occurs in various parts of Africa, show the same characteristic.† If an inquiry were made, I believe many other species would prove to have the same property. It is to be noted, however, that in the same species some examples have pink wings while others have not, and there are gradations of the colour. It would seem that the pink colour is unstable."

Mr. K. G. Blair had also pointed out "that in some of the older specimens of *C. grossa* in the Brit. Mus. Collection the wings are dirty yellow and no longer pink, suggesting that this colour is more or less fugitive." Moreover the pink colour in some of the Hyères examples of this species appeared to be already fading. The chemistry of the pigment would be a very interesting subject for investigation.

The structure and mechanism of the climbing organ of *Rhodnius prolixus*.

Dr. Wigglesworth described the histological structure of the small pad at the lower end of the tibia of the first two pairs of legs in the adult *Rhodnius*, which Mr. Gillett (1932, *Entomologist*, **65**: 123) had shown to be used by this insect when climbing up smooth surfaces. The organ is a little oval sac of pliant chitin filled with blood. On its lower surface it bears about 5000 tubular hairs 1 μ in diameter, which appear to be the outlets of unicellular glands producing an oily secretion. At their free ends the anterior surface of these hairs is cut away obliquely so that only their hind margin comes in contact with the surface as the insect climbs. To elucidate the mechanism of the climbing organ, a model had been constructed consisting of a disc separated from a glass plate by a wedge of oil. This can be moved readily in one direction (towards the open end of the wedge), but is very resistant to movement towards the point of the wedge. Evidence was brought forward that this is due to adhesion or seizure caused by the breaking down of the oil film at the point of the wedge. It was suggested that the mechanism of the climbing organ of *Rhodnius* is the same as in this model.

A detailed account of this work has been published by J. D. Gillett and V. B. Wigglesworth, 1932, *Proc. Roy. Soc.* (B), **111**: 364–376.

* In *banksi*, however, the wings are relatively small and probably incapable of flight.—E. B. P.

† Mr. Joseph Collins, of the Hope Department, has also added to the pink-winged group specimens of *C. polita*, L., from the neighbourhood of Oxford—a small species of about the same size as *C. americana*.

Wednesday, March 15th, 1933.

Prof. E. B. Poulton, F.R.S., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—H. A. Moonsawmy, Public Health Department, Georgetown, Demerara, British Guiana; A. S. Corbet, Elm Lodge, Earley, Berks; A. R. A. Goseling, Lincoln Hill, Ross-on-Wye, Herefordshire; J. H. Fidler, Warren Side, Mapledurham, Nr. Reading; W. G. Bainbridge, 200, Skipton Road, Colne, Lancs; Rev. E. F. Hemming, B.A., The Vicarage, Manningtree, Essex.

Exhibits.

Evidence believed to establish a remarkable form of " homing " in the Noctuid Moth, *Catocala electa*, Bkh.

The President said that Herr I. Tuculescu had kindly sent him a copy of his paper " Ueber einen fall von Homochromismus bei *Catocala electa* Bhk. [Bkh.]," * in which he states that this moth, when removed from its resting-place on the trunk of a poplar or willow and liberated at a short distance, immediately flies straight back to its original position. This behaviour appeared to be so remarkable, and so unlike that of moths generally, when disturbed from their resting-places, that it was essential to make certain of the author's precise meaning, and he had therefore asked his friend Dr. R. Hanitsch, Ph.D., if he would very kindly make the exact translation of essential paragraphs which are printed below :—

" I have frequently been able to watch the moth *Catocala electa*, Kkh. [Bkh.] on the grey and black bark of *Populus nigra*, L., the fore-wings of which show on their upperside darker lines and spots upon a grey background so that its colour extraordinarily resembles that of the bark. This would be a common case of Homochromism.

" I now made the following experiments. I lifted the moth from the grey bark and let it go again at a distance of 5 cm. The moth returned at once in a straight line to its original resting-place. I repeated the experiment several times, but always with the same result. The moth showed itself attracted to the grey bark of the Poplar tree, like iron filings to a magnet.

" I increased the distance in order to ascertain how far the tropism is perceptible. At a distance of 10, 20, and 30 cm. from the tree the results were always the same : the return to the bark took place, with very slight deviations, always in a straight line.

" The deviations to the left or the right from the straight line were much greater at a distance of 40, 50, or 60 cm., so that the moth, after having taken an irregular flight, winding in all directions, settled down 20 to 30 cm. away from its first resting-place.

. . . . . .

" Considering the uniform and mechanical appearance of the movements of the moth, I believe that they are the result of a tropism, or more exactly, of a Chemotropism.

. . . . . .

* *Publicatiunile Societatii Naturalistilor din Romania* (Nr. 10, 1932).

"Continuing the experiments, I noticed that at greater distances the flight of the moth became much more irregular. . . . At a distance of 1 m. to 1·5 m., the impulse of direction was probably much weakened; for the moth flew away in a different direction.

"I made a similar experiment with *Salix alba*, L. I first considered the stimulus to be optical, but soon came to a different conclusion when a moth, blinded with NO_3Ag, showed the same reactions. The stimulus therefore cannot possibly have been an optical one, and it is probably of a chemical nature, connected with the grey and black pigments of the bark of *P. nigra* and *S. alba*. For *C. electa* is found only on grey or black bark.

"It seems as if the Chromotropism would explain the selection of coloured bark by the moth, and then such selection would not be voluntary, but involuntary. The moth settles upon the grey bark, not in order to become invisible, but because it is forced to do so. The Homochromism is therefore, at least in this species, a quite secondary and accidental phenomenon."

Further details as to the conditions under which the experiments were conducted upon the blinded moth would be interesting. The conclusions of the author as stated in the last paragraph appeared to be, at least in part, the same as those usually held—viz. that the moth in selecting a resting-place is acting in response to stimulus and not making a considered choice. But that the result is "quite secondary and accidental" is a very different proposition; for the response to stimulus has been so guided and perfected as to produce the "Homochromism." And this consideration suggests the desirability of further experiments on the same and other species of moths; for the results as described by the author imply a fatally disadvantageous response to stimulus, as well as a behaviour which is, as previously remarked, totally unlike that of moths generally. If, in past times, *Catocala electa*, when disturbed by an enemy, had immediately flown back to its resting-place there would be few if any of this species in existence for Herr Tuculescu to investigate.

The following facts recorded by Mr. W. Parkinson Curtis, in 1932, *J. Ent. Soc. S. Engl.*, **1**: 35, indicate the possibility of a true "homing" instinct in *Amphidasys betularia*, L. A male of this species, easily recognisable by injuries which evidently did not interfere with its powers of flight, was seen on 8 June, 1932, at rest about five feet from the ground on a horse-chestnut tree at Bournemouth. On 9 June it had gone, but on the following day was resting "within two feet of the first position"; on 11 June it was "on the same tree, but much higher and in a more sheltered position"; on 12 June "it had returned to its first position"; and on 13 June had finally disappeared.

It is much to be hoped that these interesting notes will lead to specially directed observations on the same moth and, above all, on others with a more perfected form of protective resemblance.

Dr. William Beebe's notes on butterflies and moths attacked by birds in the Galapagos Islands, &c.

The PRESIDENT said that his friend Commander J. J. Walker had kindly directed his attention to the following record in Dr. Beebe's *Galapagos: World's End*, London, 1924, pp. 93–96.

" *At Eden Island, end of March*, 1923.—Returning to the Martins' beach [the Galapagos Purple Martin, *Progne modesta*] I watched the birds and within five minutes saw a most interesting thing. A yellow butterfly fluttered slowly down over the cliff towards us, and at once a martin set off in pursuit. It was a long zigzag chase with the ' Sulphur ' trying to dodge, now down to the water, back to shore, and around in spirals—a veritable whirling bit of yellow tissue. At last an unlucky turn fairly shot the insect into the mouth of the martin and the bird flew about for a full minute before the wings disappeared, either dropped to the ground or swallowed.

" Urged by Professor Poulton I have for many years kept on the watch for instances of birds attacking butterflies, as considerable weight of certain mimicry and colour theories depends upon butterflies having aerial enemies. That lizards often devour these insects is well known, but a bird as assailant is a rarer event. In Ceylon and in Burma, in the high Himalayas, and in central China I have seen such pursuits, but they were few and far between and seldom successful, often appearing to be mere half-hearted, sporting activities, a pitting of wing-power against a worthy opponent, as birds will pursue each other in mid-air. I have seen many thousands of opportunities neglected, where migrating butterflies were passing, scores to the second in sight, and flycatchers and swallows hawking about, wholly indifferent to this abundant but fuzzy source of food.

" Seventeen years ago E. W. Gifford made four notes on this subject, writing of the martins of Tagus Cove, Albemarle [Island]. He says :—

" ' I saw one with a butterfly in its mouth being pursued by two others.'

" ' I saw one enter its nest with a medium-sized yellow butterfly in its mouth.'

" ' I saw one make a dozen or so unsuccessful attempts to catch a yellow butterfly which was crossing the cove.'

" ' On April ninth I noted one chasing a sphinx moth over Tagus Cove; the moth finally dropped into the water and the bird left it.'

" Stimulated by the observation which I had made so early in my visit to the islands, I kept on the watch, and for the first time in my life I found aerial birds which fed largely on butterflies and moths. Within five minutes after my first butterfly-martin incident, I saw others chasing a red butterfly which they failed to capture. The first butterfly and at least two of those mentioned by Gifford were the cloudless sulphur, *Callidryas eubule*, almost identical with our northern form, and the reddish one was the fritillary, *Agraulis vanillae*, which I have already mentioned. During the ensuing twenty days which I spent on the islands I made notes of thirteen additional instances of the same character, twelve of the victims of which were sulphurs, and the other a fritillary.

" Not only this, but when I returned to the *Noma* from the first trip to Eden and examined the food of the martins I had taken, I found that both the young fledgling and its male parent had been feeding almost entirely upon small moths. Two wings were still recognisable as a new species, *Melipotis harrisoni*, Schaus. At another island, as I shall describe in greater detail, I saw the same species of bird pursuing and feeding on a small diurnal sphinx moth [*Deilephila lineata*, Fabr.].

" It is a usual thing for cuckoos of various species to feed upon hairy caterpillars and other unpleasant appearing provender, but it is not common for diurnal birds to be willing to devour such fuzzy creatures as are these millers. I remember

in Garhwal, high up in the Himalayas, half round the world, I once shot white-crested Kaleege pheasants with their crops stuffed with two or three dozen small moths, all swallowed whole and quite identifiable. As I shall mention again, both the mockingbirds and flycatchers of the Galapagos were expert and willing butterfly catchers. All this is in very decided contrast to what obtains elsewhere, for in my experience, the relation between birds and butterflies is quite a negligible factor in any theory of Lepidopterous evolution of pattern, colour, form or activity. With winged grasshoppers of all sizes so abundant everywhere in these islands, the diet of butterflies became all the more inexplicable."

Many naturalists would, on the contrary, conclude from Dr. Beebe's experience, set beside that of many other observers, that the attacks of birds are by no means a negligible factor in the evolution of butterfly patterns and behaviour. He was fortunate in these islands but unfortunate elsewhere. Others have been fortunate in many parts of the world.

Butterflies with injuries probably caused by birds.

The PRESIDENT exhibited the following butterflies, continuing the series of 1932, *Proc. Ent. Soc. Lond.*, **7**: 71–3. All the specimens may be studied in the Hope Dept., O.U. Mus.

Epinephile jurtina, L. (*janira*, L.), ♀.—All four wings bear the distinct imprint of a round-tipped beak, almost certainly caused by a single seizure when the insect was at rest. The closed wings were nipped across the basal half of the F.W. costa, the beak-tip extending nearly to the centre. Specimen fresh. W. Rait-Smith, 3 July, 1926, Muchalls, Kincardineshire.*

Apatura ilia, Wien. Verz., ♂—L.H.W. with clean, deep nick at anal angle. Fresh. Col. H. D. Peile, 18 July, 1932, settled on ground in farmyard, near spot where *Apatura iris*, L., ♂, with beak-mark on L.H.W. was taken, 12 July, 1932, Aix les Bains, Savoie, France. The *iris* is in the Brit. Mus. Coll. The injury to *ilia* was noted before capture.

Pyrameis atalanta, L., ♂—H.W.s and anal area of F.W.s much torn, some of the injuries being roughly symmetrical and inflicted when the wings were closed. Some of the edges straight as if caused by a scissors-like cut, and a linear mark joins the straight edges on R.F. and H.W.s, suggesting a single seizure by a long beak. H. L. Andrewes, 10 October, 1932, on michaelmas daisy, Bere Regis, Dorset.

* My friend Mr. Rait-Smith has very kindly written, 11 April, 1933, about this most interesting example: "the *jurtina* was flying in company with a good many others of the same species over a stretch of rough broken ground sloping from cliffs, about 200 feet high, down to the sea in a small sheltered bay. A large colony of gulls were breeding at one corner of this bay where the cliffs are somewhat higher and a small area of rather swampy ground between the foot of the cliffs and high-water mark may have been the breeding-ground of some of the numerous ducks, scaup, etc., which frequent this coast. I think, if my memory serves me rightly, I also saw some coots here.

"There was nothing to distinguish this particular *jurtina* from its fellows when I caught it, and I should have probably overlooked it altogether had I not been giving this species rather a lot of attention at this time, examining all I could catch for aberrational forms.

"I have looked up my notes for the day on which I took this specimen and find I have made the following remark: 'Nothing in the way of aberrations to-day except one ♀ *jurtina* which appears to have been attacked by a bird or lizard, which may be of some interest to Professor Poulton.'"

The beak-mark is so remarkable and apparently characteristic that I hope the species of bird may be determined by an ornithological friend.—E.B.P., 13 April, 1933.

Parnassius apollo, L.—The specimen taken by Mr. W. Parkinson Curtis and previously described (*ibid.*, pp. 71, 73), was exhibited, having been accidentally omitted on 16 November, 1932. It was interesting that the almost complete absence of the L.H.W. had interfered so little with the powers of flight.

The aposematic display and distasteful qualities of an Acridian (*Phymateus*) in Madagascar.

The PRESIDENT said that his friend Mr. A. H. Hamm, A.L.S., had kindly given him the following note with a copy of a paragraph from J. Sibree's *Naturalist in Madagascar* (Lond., 1915, p. 112).

" The author, after giving examples of Protective Resemblance, such as the various Grasshoppers looking like dried grass and thus presenting a close resemblance to their environment, describes the following strongly contrasting instance of Warning Colours :—

" But the most handsome insect one sees on the downs is the Valàlanamboà or dog-locust. This is large and is gorgeously coloured, the body being barred with stripes of yellow and black, while the head and thorax are green and blue and gold, with shades of crimson, and the wings are bright scarlet. It seems a most desirable insect for a cabinet, but it is impossible to keep one, for it has a most abominable smell, and this appears to be its protection, as well as its probable possession of a nauseous taste, so that no bird or other creature feeds upon it. This insect seems therefore a good example of ' warning colours '; it has no need of ' protective resemblance ' lest it should be devoured by enemies; it can flaunt its gay livery without fear, indeed this seems exaggerated in order to say to outsiders, ' Hands off ! ' ' *Nemo me impune lacessit.*' The Malagasy have a proverb which runs thus : ' *Valàlanamboà : ny tompony aza tsy tia azy* '—*i.e.* ' The dog-locust, even its owner dislikes it.' "

The PRESIDENT said that as he was anxious to know the name of this interesting and evidently aposematic insect, he wrote to his friend Mr. B. P. Uvarov and asked him whether it was a *Phymateus* (ACRIDIDAE), and, if so, whether the description was sufficient for a determination of the species. He kindly replied : " The insect described by Sibree is certainly a *Phymateus*, but the description is equally applicable to several Madagascan species. The habits of *Ph. puniceus*, Bol., in Madagascar have been recently described by B. N. Zolotarevsky in 1930, *Bull. Soc. Ent. Fr.*, **1930** : 283."

Being unable to consult the Bulletin at the time, the Registrar had very kindly sent him a translation of Zolotarevsky's paper, from which the following passages were quoted below :—

" *Phymateus puniceus*, Bol., is a well-known Orthopteron in Madagascar. It attracts attention by its large size and bright coloration.

" The natives, considering it especially from the point of view of edibility, do not eat it because of the disagreeable smell, which renders it unsuitable for food, nor have I observed animals eating this species.

" The adults are solitary and sedentary. They move little and slowly. When surprised they open the elytra and the wings rapidly, and show the beautiful coloration, rose-spotted, of the latter. Once opened, the elytra and the wings

remain in this position for some time, and often the insect moves without closing them. When the insect is not further disturbed it commences to close the wings with a slow jerky movement.

" The opening of the wings in case of alarm is the only rapid movement I have observed in this species. It has hardly any power of leaping; the adults sometimes spring a little way by flapping the wings, but the start is very clumsy, and never exceeds 10 cm. I have never seen *P. puniceus* fly away to escape attack."

The author also states that the males sometimes fly heavily in sunshine and calm weather, but he has never seen the females flying. Unlike the adult, the larvae are markedly gregarious, moving from one plant to another in Indian file and becoming massed on the branches. The larvae hatched from the same ootheca band together and may fuse with the lines of other bands encountered when on the march. The descent from a plant already occupied, and movement along the ground appeared to be determined by the rise of temperature consequent upon the sun's elevation, not by the exhaustion of the food-supply.

Although, so far as he was aware, there were no recorded observations on the actual behaviour of insectivorous animals towards the Madagascar species of *Phymateus*, such observations had been made on African species. Thus Sir Guy Marshall (in *Trans. Ent. Soc. Lond.*, 1902) recorded that *P. morbillosus*, L., was refused after several attempts by a captive Mungoose (*Herpestes galera*, p. 377, although a specimen was found in the stomach of *Coracias olivaceiceps*, Sharpe, p. 349, and one in the crop of *C. caudata*, L., p. 356. The author thus described the behaviour of the disturbed insect: " If annoyed when settled on the ground they often raise their wings over their backs (clearly to exhibit the bright colours), exuding at the same time an odoriferous frothy liquid from the thorax " (pp. 356, 357).

Dr. G. D. Hale Carpenter's observations on another species, *P. viridipes*, Stål, conducted near Tabora, Tanganyika, in 1916–17, and published in *ibid.*, 1921, showed that the behaviour of a monkey (*Cercopithecus*) was similar to that of the Mungoose (pp. 11, 14, 27, 34, 53).

Notes by Dr. R. Hanitsch, Ph.D., on female cockroaches (BLATTIDAE) which carry their young.

The PRESIDENT communicated the following interesting notes written by his friend Dr. Hanitsch :—

Shelford, in *A Naturalist in Borneo*, London, 1916, p. 117, reports two species of viviparous cockroaches which carry their young, viz. *Phlebonotus pallens*, Serville, from India, and *Pseudophoraspis nebulosa*, Burm., from the Malay region. Of the latter he records that he " once captured a female . . . with the underside of her body covered with newly hatched young ones clinging to it." The label in Shelford's hand-writing on a female of this species in the Hope Collection confirms the above statement as to the method of carriage, but the young are wanting.

Another species in which the female carries the young on the under surface is *Perisphaeria glomeriformis*, Lucas, from the Philippines, Cochin China and Malaya. Although the male is fully winged, the female is apterous and the nymphs cling to

her under surface, as may be seen in the exhibited specimen, from Aroroy, Philippines, lent by the Stockholm Museum. A male (Mt. Makiling, Luzon: *Baker*) and female (Davas, Mindanao: *Baker*), lent by the Vienna Museum, were also exhibited. This example of carriage of young by a female Blattid has apparently not been hitherto recorded.

Shelford states (*l.c.*) that the young of *Phlebonotus pallens* have been seen "running about on the upperside of the abdomen of the mother and covered over by the tegmina, or wing-covers." The beautiful photograph exhibited to the meeting, and clearly showing seven nymphs beneath the wings on the back of a female *Ph. pallens*, was sent to me by Dr. Hem Singh Pruthi, of the Zoological Survey of India, with the following note :—

"In the summer of 1929 I collected one specimen of a cockroach from a small stream near Yercaud (*ca.* 4500 ft. Shevroy Hills, South India). It was near the edge of the water channel. It was preserved in spirit. At the time of collection I did not notice anything special about it, but while sorting the collected material recently, it was noticed that it had young ones under its wings, which are now quite clear. The specimen with the young *in situ* was photographed (a copy enclosed). After this I dislodged the nymphs to see whether they were fixed to the abdomen. They were quite free."

A second species which carries its young on the dorsal surface has been kindly submitted to me for examination by the Basle Museum. It is *Ellipsidium aurantiacum*, Saussure, from Katherine, N.T., Australia (*Prof. Handschin*), 1931. This female has about 10 young clinging to it, viz. 4 to the upperside of the apex of the tegmina, and 6 to the ootheca which projects far beyond the body. There are no young on the under surface of the abdomen.—R. Hanitsch, 20 February, 1933.

The use of infra-red photography for micro-photographic work.

Dr. H. Eltringham exhibited a number of lantern slides to illustrate the use of the infra-red rays in micro-photography. Whilst there appeared to be little advantage over the ordinary chromatic plate when the object had been stained with haematoxylin, there was a marked increase of detail with certain other stains, but especially with cleared unstained chitinous preparations.

The source of the attractive scent produced by female moths.

Dr. Eltringham also showed micro-photographs of sections of the posterior part of the abdomen of a female *S. carpini*, and stated that there was no evidence of the existence of any specially differentiated gland for the production of the guiding and attractive scent which enabled the males to find the females. The hypoderm cells in this region are much enlarged, and the cuticle is rugose and papillate, thus affording a large surface area. He had little doubt that the scent was secreted by the modified hypoderm, and diffused from the cuticle by osmosis.

Sense-organs in the tarsi of Lepidoptera.

Dr. Eltringham further gave an account of the chemo-receptive organs in the tarsi of a butterfly (*P. atalanta*), his observations having been made as a sequel to Prof. Minnich's discovery of the sensitivity of the tarsi in this and other insects.

Wednesday, April 5th, 1933.

Mr. R. W. Lloyd, Vice-President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—W. E. Cox, 98, Marlborough Road, Cardiff; R. G. Fennah, B.A., Emmanuel College, Cambridge; Major E. A. Glennie, Geodetic Branch, Survey of India, Dehra Dun, U.P., India; O. C. Lloyd, Great Dixter, Northiam, Sussex; Dr. Paul Martin, Casilla No. 112, Lima, Peru; R. G. C. C. Sandeman, Dan y Parc, Crickhowell, Breconshire; J. T. Wattison, Rua da Circumvalação, Senhora da Hora, Portugal.

Obituary.

The death of Mr. J. J. F.-X. King, a Fellow of the Society, was announced.

Exhibits.

A very rare Scolytid from Windsor Forest.

Mr. Donisthorpe exhibited a series of the very rare *Ips* (*Tomicus*) *suturalis*, Gyll., which he had found in abundance in, and under, the bark of a fallen spruce tree in Windsor Forest on March 24th and April 1st last.

The only other captures in this country were—one specimen by the late Dr. Sharp in Inverness-shire in 1869; and in 1931 Mr. Hansom discovered it in Scots fir poles in the Windsor Forest area some 10 miles distant from the exhibitor's locality.

He also exhibited a specimen of *Hypophloeus fraxini*, Kugl., which he had taken in the burrows of the *Ips* in Mr. Hansom's locality on Nov. 6th, 1931. This parasite had only been taken in Dean Forest in this country before, where Sir T. Hudson Beare and the exhibitor had discovered it new to Britain in the burrows of *Ips sexdentatus* in 1922.

The relation between *Catopsilia pomona*, Fabr. and *C. crocale*, Cram.

Dr. F. A. Dixey exhibited specimens of the Eastern Pierine genus *Catopsilia*, and remarked on them as follows :—

There is an old question as to the relation between the two well-known Pierine forms from the Oriental and Australian Regions, *C. pomona* and *C. crocale*. They have been variously regarded as conspecific and as specifically distinct. In 1902, *Trans. Ent. Soc. Lond.*, **1902** : 189, I dealt with the question at some length, and gave it as my opinion that no line of specific demarcation can be drawn between them. The reasons were (1) that a complete gradation exists between the extreme form of *crocale* on the one side and of *pomona* (in which is included the form *catilla*, Cram.) on the other, (2) that the two forms occur together in the same flight, and (3) that they have actually been taken paired. To this may be added the evidence supplied by a consignment of 212 specimens sent to the Hope Department by Mr. J. C. Moulton, and stated by him to have all come from a swarm of larvae found defoliating a tree overhanging the Director's Office in the Botanic Gardens, Singapore, and all to have hatched out within two or three days. These specimens were carefully examined by me, and the result of a count that I made of them

will be found in 1924, *Proc. Ent. Soc. Lond.*, **1924**: xxiv. Of the 212, 197 were *crocale* ♀, varying from extreme *crocale* to transitional forms nearer to *crocale* than to *pomona*; 8 ♀♀ I should call about half-way forms; 4 ♂♂ and 3 ♀♀ were distinctly *pomona*. No *crocale* males were included, the only males present being the four male *pomona*.

Among the authorities in favour of the specific identity of the two forms are De Nicéville (1894), Piepers (1898), and Klots (1929). Among those who consider them to be distinct may be reckoned many persons who are familiar with both forms in India, and more especially Fruhstorfer (1909) who finds differences in the genitalia, and L. Martin (1895) who in writing of the butterflies of Sumatra bases his opinion on the following grounds:—*crocale* is far commoner than *pomona*; the habits of the two forms are different; the antennae of *crocale* are black, those of *pomona* are red; the pattern in the females of both forms is variable, and the range of variation is distinct in the two. But, as De Nicéville rightly remarks, "the distinctive characters on which Dr. Martin relies are all quite inconstant, and entirely break down" when large numbers of both forms are examined. In view, also, of well-known facts concerning the difference of habit between *Precis natalensis* and *P. sesamus*, which have been absolutely proved by Sir Guy Marshall to be seasonal phases of the same species, the objection on the score of habit cannot be held conclusive.

An elaborate discussion of the question has lately been undertaken by J. Drosihn of Halle in the course of an Inaugural Dissertation published in the *Ent. Rundsch.*, Stuttgart, 1933. Failing to find any means of distinguishing these forms by the characters relied on by Fruhstorfer, he inclines to the opinion that *pomona* and *crocale* are one species which is capable of existing in two forms with occasional intermediates. He is careful to say that he does not doubt Fruhstorfer's observation, but he questions whether that author has examined many specimens. Drosihn himself has examined the genitalia of no less than 67 males (of which, reckoning by the presence or absence of spots on the underside of the hind-wing, he counts 33 *crocale* and 34 *pomona*), with the result stated; nor does he find it possible to separate the forms by the colour of the antennae.

Drosihn's work on the genitalia is a valuable reinforcement for the view of the specific identity of the two forms. His opinion on another point, however, appears to be of less weight. In the course of my paper above referred to (1902), I mentioned that the relation between *pomona* and *crocale* so much resembles that between forms which there is reason for regarding as cases of seasonal dimorphism, that I was led to suspect that the dimorphism of *C. pomona-crocale* might also have a seasonal significance. As bearing on this supposition I cited a statement by T. Batchelor, who had collected many specimens near Brisbane, in Queensland, and who wrote that in that locality *crocale* is the summer and *pomona* the autumn form of the species. This statement, by the way, is attributed by Drosihn not to Batchelor, who was the actual collector, but to Prof. Poulton, who communicated it to me on Batchelor's authority. In the same paper I gave full weight to the undoubted fact that *crocale* and *pomona* may often be found on the wing together; this is claimed by Drosihn as showing that here there can be no question of seasonal dimorphism. But he has taken no account of the well-established fact that cases are known where forms that are undoubtedly conspecific show a dimorphism

which is related to season in some parts of their range, but independent of it in others. *Catopsilia pyranthe*, Linn., which is closely related to the species under discussion, has a well-marked dimorphism which even De Nicéville, who doubts the seasonal relation of *crocale* and *pomona*, allows to be seasonal in India, though not in Sumatra. My conclusion as to these two forms was stated as follows:— "If then we are to trust the observations that have been cited, we are led to the conclusion that in these Catopsilias, viz. *C. pomona-crocale* and *C. pyranthe*, we have to deal with two polymorphic species, each of which has no doubt several geographical forms, and each of which shows, in most localities, a special tendency to cleavage into two well-contrasted types. These latter phases in each case are in some parts of the range of the species dependent on seasonal changes; in other parts, however, they show no such connection." Other similar cases were adduced in my paper; and if they had been duly considered by Drosihn, I think he might have been led to modify his rather positive assertion quoted above.

Drosihn finds no difficulty in separating his 67 specimens into *pomona* and *crocale* by the presence or absence of spots on the underside of the hind-wing. But it is to be remarked that his observations appear to have been confined to the male sex. If he had examined as large a number of females, he would probably have been led to recognise that a complete gradation does exist between them; nor would he, I think, have had occasion for his speculation that my assertion about transitional forms may have borne reference only to the colour of the antennae.

Photographs of the "Locust glacier" on Mount Cook, Montana.

Dr. C. B. Williams exhibited three photographs, taken by Prof. Ruggles, of the University of Minnesota, of a glacier on Mount Cook, Montana, U.S.A., in which are embedded enormous numbers of insects, particularly locusts. The locust had been examined and found to be *Melanoplus spretus* (Rocky Mountain Locust), the migratory phase which has not been seen in the U.S.A. for about 50 years, although *M. mexicanus*, the solitary phase, has been abundant.

The temperature of the insect's environment.

Mr. Kenneth Mellanby said that in recent years, the importance of the effects of climatic conditions on insects has been increasingly realised. It has also been realised that the conditions measured by meteorologists are not those which affect insects, and various micro-climatic investigations have therefore been carried out. It will greatly add to the value of the results obtained from experimental work with insects in the laboratory, when we are able to compare the conditions of the experiments directly with those to which insects are normally subjected.

Experiments determining the thermal death points of insects indicate that there must be great differences between the temperatures to which tropical insects are subjected and the temperatures measured by the meteorologists. Adults of *Culex fatigans*, *Anopheles maculipennis* and *Aedes aegypti* are killed by exposure for one hour to 42° C. (107° F.). Meteorological records from places where these insects are found give temperatures greatly in excess of 42° C.—which means that those insects which survive in the adult stage are inhabiting places where the temperature is considerably lower than that recorded. The principal factor

responsible for keeping the temperature down is evaporation of water. When one cubic centimetre of water is evaporated, between 500 and 600 calories are absorbed, causing a considerable fall in temperature at the point where evaporation takes place. Man survives high temperatures by the evaporation of water (sweat) from his body. Some large insects can keep cool for limited periods in a similar manner, but most are so small that they contain an insufficient amount of water to cool themselves appreciably (Mellanby, 1932, *J. Exper. Biol.*, **9**: 223–231). But in their cases evaporation may allow them to withstand high temperatures—the evaporation taking place not from their bodies but from the spot where they are living.

It is possible to discover many places where the temperature is reduced by evaporation. Martini and Teubner (1933, *Arch. Schiffs-u. Tropenhyg., Beih.* **37**: 1–80) have shown that among grass in a meadow the temperature may be 7° C. lower than that of the air just above the grass—evaporation goes on from the grass all the time. In rat holes, in moist soil, the temperature is lower than that of the dry air outside (Buxton, 1932, *Ind. J. Med. Res.*, **20**: 281–297). The conditions between the skin and shirt of man are influenced by the external condition—dry air allows more evaporation and produces a lower temperature than does moist air at the same external temperature (Mellanby, 1932, *J. Hyg.*, **32**: 268–274).

When water is exposed to air which is not saturated, evaporation causes its temperature to fall. The amount by which the water is cooler depends on the humidity of the air, for the lowering of the temperature is directly proportional to the rate of evaporation, which is governed by the saturation deficiency. In some experiments (Leeson & Mellanby, 1933, *Nature*, **131**: 363), a dish of water was kept in still air at 30° C. at various humidities. When the air had a relative humidity of 40 per cent., the temperature of the water was 22° C. Air immediately above the water was at 22° C., one inch above was at 26° C. and two inches above there was no reduction in temperature. Even more striking cases of temperature gradients have been observed. A deep glass tank, with damp sand at the bottom, was heated by electric bulbs hanging inside. The air temperature rose rapidly to 55° C., and a thermometer with its bulb two inches from the sand registered this temperature. But the temperature of the surface of the sand was only 38° C.—a fall of 17° C. (31° F.) in a distance of two inches. The cases described above were in still air. In moving air, greater evaporation would cause even greater drops in temperature.

Many entomologists believe that large amounts of water must be evaporated to cause the temperature at any point to be lowered appreciably. This is not the case. If, for instance, a rot hole in a tree contains water with a surface area of 600 sq. cm. (about 8 × 12 inches) and that water is kept 5° C. below the temperature of the surroundings by evaporation, then about 100 c.c. will be evaporated daily—which means that the depth will decrease by under 2 millimetres ($\frac{1}{12}$th inch) daily. Thus small collections of water containing insect larvae may be kept cool during the period of larval life. The humidity of the air regulates the rate of evaporation, and so may affect aquatic as well as terrestrial stages in insects' lives. It is important that all those working in the field on insect behaviour should realise that steep temperature gradients exist, for when an insect appears to be attracted by moisture or some chemical stimulus, it may actually be attracted by a low

temperature. Whenever possible, the conditions at the *exact* spot where the insect is resting should be measured, for they may be quite different from those even a few inches away.

Papers.

The following papers were read :—

(1) " On the tarsal sense-organs of Lepidoptera," by Dr. H. Eltringham, F.R.S.
(2) " On the internal anatomy of some Thysanoptera," by U. S. Sharga, M.Sc.

CENTENARY MEETING, IN THE ROOMS OF THE ROYAL GEOGRAPHICAL SOCIETY, 3RD MAY, 1933.

Centenary Meeting, 3rd May, 1933,

held in the rooms of the Royal Geographical Society, Kensington Gore, at 3.0 p.m.

Professor E. B. Poulton, F.R.S., in the Chair.

Present :—218 delegates and Fellows of the Society and 162 guests.

The President, in opening the meeting, said :—" We meet here to celebrate the greatest day in the hundred years of our history, but we are also taking part in a meeting which is held, in accordance with our Bye-Laws, on the first Wednesday in May. I must therefore open the proceedings formally, and I will ask the Honorary Secretary, Dr. S. A. Neave, to read the minutes of the last meeting."

The minutes having been read and agreed,

The President said :—" I have received an intimation from the Secretary of State for Home Affairs that His Majesty the King has been graciously pleased to command that the Society shall henceforth be known as the Royal Entomological Society of London. The Society will wish, I am sure, to convey, through the proper channel, an expression of their gratitude to their Patron, His Majesty the King. I therefore propose that this meeting should authorise me to despatch a suitable telegram to the Home Secretary for transmission to His Majesty. I take it that that is the feeling of the meeting." (Applause.)

" I therefore propose to send the following telegram: 'At their Centenary Meeting held to-day the President, Council and Fellows of the Entomological Society of London were deeply gratified to learn that on the occasion of the Centenary of the Society His Majesty the King has been graciously pleased to command that henceforth the Society shall be known as the Royal Entomological Society of London, and they desire to take this opportunity of humbly expressing to His Majesty their heartfelt thanks for the signal honour that he has been graciously pleased to confer upon them; and they wish to assure His Majesty, through you, that they will ever do all in their power to promote the diffusion of entomological science throughout His Majesty's realm." *

The Hon. Secretary said :—" It is now my pleasure, as the mouthpiece of the Council, to ask this meeting to confer upon our President the title of Honorary Life President. I need hardly remind you that this is the highest honour that it is in the power of this Society to bestow. There have, in fact, been only two other

* The following reply was received to the above telegram :—

Home Office, Whitehall,
3rd May, 1933.

Sir,

I am directed by the Secretary of State to acknowledge the receipt of your telegram of to-day expressing thanks to His Majesty the King, on behalf of yourself, the Council and Fellows of the Entomological Society of London at their Centenary Meeting, for the grant of permission to use the title " Royal " in the name of the Society.

I am, Sir,
Your obedient Servant,
R. L. Bicknell.

The President,
The Royal Entomological Society of London,
41, *Queen's Gate, S.W.* 7

holders of the office in the hundred years of our History. It was first conferred on the Rev. William Kirby, the 'Father of British Entomology' as he was called, shortly after the foundation of the Society in 1833, and secondly on Professor Westwood, when we celebrated our Jubilee in 1883. It is, therefore, I think, difficult to imagine a more fitting occasion than the present for us to invite our President, Professor Poulton, to accept this honour." (Applause.)

The President said :—" I find it very difficult to think of words by which to express my deep appreciation of this great honour. I have received nothing but kindness and encouragement ever since the day I became a Fellow—even before it, when my first paper was read in the year of the Jubilee. Earlier memories come back, memories of schooldays over sixty years ago, when the very name of Entomology was an inspiration, and when I looked forward to the time when I might become a member of this great Society whose life was, and is, devoted to that branch of Natural History which, from childhood, had always appealed to me more strongly than any other. I am especially grateful to the Society for its generous decision which links my name—although as an entomologist a most humble follower—with that of my illustrious predecessor in the Hope Professorship, my kindly teacher and friend, Professor Westwood; I am also grateful in that this high honour is thus associated with Oxford, the ancient University which meant so much to him, and to me far more than I can express." (Applause.)

The Hon. Secretary said :—" I have also to ask the meeting to approve the recommendation of the Council that, in further celebration of this occasion, Commander J. J. Walker, The Rev. George Wheeler and Mr. W. G. Sheldon be created Special Life Fellows. As most of you are aware, they have all served the Society in the past for long and arduous periods as Honorary Officers. Commander Walker was Hon. Secretary in 1899, and again from 1905–1918. Mr. Wheeler was Hon. Secretary from 1911–1921, and Mr. Sheldon Hon. Treasurer from 1918–1928."

(Carried by acclamation.)

The names of Candidates for Fellowship were then read, and the obligation book was signed by those Fellows present who had not already done so.

The President : " It is a very great pleasure to every member of our Society to welcome so many brother naturalists, each a representative of a kindred Society or Institution, and to send through them our warmest appreciation of the sympathy and kindly feelings which have led to their presence here to-day as bearers of friendly greetings and congratulations.

" The Delegates we have the great honour to receive come, in the words of the leader in *The Times* of this morning, ' from all parts of the Empire and the world, bringing messages of homage and congratulation from Learned Societies, Universities, Museums and State Departments . . . Biological Science, Medicine, Hygiene, Agriculture and Forestry ' are all represented.

" The most important function of Societies such as ours is, I believe, to promote union between members with interests in common—to achieve this not only in the Library, the Museum or the Laboratory, but also in the field, for the observa-

tion of living nature, so that our most delightful and stimulating experiences are so often shared with others to whom they make the same appeal. And on great occasions, such as the Centenary of the Entomological Society of France in Paris last year, and of our Society in London to-day, there is the heightened pleasure of meeting and welcoming naturalists from other lands. For this reason I trust that the warmth of our welcome will not be measured by the length of this brief address. We all know full well that such opportunities are most precious, and in these depressing times by no means as frequent as we should wish; but that, happily, they are freely offered on this and the following days of our Celebrations—offered, and, I hope, not to be abbreviated except of inexorable necessity.

"I do not think I need speak of the hundred years completed to-day; for an admirable account of the Society—its origin and its wanderings from home to home, and, above all, the great men who have served it so well—all this is before you in *The History of the Entomological Society of London*, 1833–1933, written by our Hon. Secretary, Dr. S. A. Neave, with the able assistance of our Registrar, Mr. F. J. Griffin, with a financial chapter by the Hon. Treasurer, Mr. A. F. Hemming. In the same volume I have attempted to recall memories from the earlier years following the Jubilee.

"The Royal Entomological Society of London extends a warm welcome to the Delegates, British and Foreign, and trusts that they will enjoy, as fully as the Fellows of the Society, the opportunity of meeting many friends, both old and new, and will carry with them on their return the happiest of memories."

Sir Peter Chalmers Mitchell, Secretary of the Zoological Society, on behalf of the British Delegates said :—"Mr. President of the Royal Entomological Society of London, my lords, ladies and gentlemen, upon me has fallen the honour of replying to your welcome on behalf of the Delegates from Great Britain and the British Empire who have come here to give you the messages of homage and congratulation with which we have been entrusted.

"Before I try to speak for my colleagues generally, there are a few personal things which I should like to say. I am here to-day, in the first place, as a Delegate of the Zoological Society of London. The Royal Entomological Society of London and the Zoological Society of London are almost of the same age. We celebrated our Centenary only four years ago; and many of the men who founded our Society helped to found your Society. Your magnificent series of Transactions have run through the century parallel with our own Scientific Proceedings and Transactions, and I venture to say that these two sets of publications taken together are unequalled as a record of the progress of knowledge in Zoological Science. As there are here to-day representatives from other countries, I should like to add this; these two Societies, yours and ours, throughout the century of their work, have been untrammelled by State aid; we have not even been under the domination of universities. We are conspicuous examples of what can be done by the free voluntary association of persons who are only united by their desire for common objects.

"It is a personal pleasure to me that I should be addressing these words to you, Sir, as President of the Royal Entomological Society. When I was an undergraduate at Oxford, you, Professor Poulton, were a young lecturer, and I

well remember the stimulus and encouragement you gave us by your demonstrations in the Museum and by the field excursions upon which you taught us to observe. I claim to be one of the first of a long series of Oxford men whom you helped to equip for their life work in Zoology. I have enjoyed your friendship for now a long half-century, and I have watched with affectionate admiration the great work that you have done for applied and for abstract entomology.

"What am I to say on behalf of the distinguished, numerous and diverse body from Great Britain, for whom I am supposed to speak? In the first place, we all come here in a spirit of good fellowship to rejoice with you upon this great occasion; but it is not merely in the spirit of good fellowship, it is with a lively sense of gratitude for the benefits we have received from you in your branch of Zoological Science. Some of us are representatives of Entomology; others of us, as you have said, represent the Universities, Government departments, Museums, Agriculture, Hygiene and a vast number of interests in abstract and applied zoology; we are all equally indebted to you. We come here not merely to rejoice with you, but to offer you our sincere thanks for the work the Royal Entomological Society has done.

"In the early volumes of your Transactions you included the Crustacea in your purview; but whether the connotation of the word 'Insecta' is that which the older naturalists used or whether you restrict it to Hexapoda, it remains true that the class is unique in the animal kingdom for the multitude of its numbers and for the variety of its forms. I understand that nearly half a million species of insects have been collected, named and described, and this probably forms only a small proportion of the insects which have yet to be collected, named and described. You have only to look at any volume of the Transactions of the Royal Entomological Society to see what a great share the Society has taken in bringing scientific order into this vast assembly of forms. But the species of insects, however numerous, are variations of a simple morphological type. To this type there can be referred easily the most precise adaptations and the most wildly fantastic aberrations which nature has lavished upon this class more freely than upon any other branch of the Animal Kingdom. This common type, moreover, has contrived to adapt itself to every form of climate, to every form of surrounding, to succeed underground, to succeed in the air; it has succeeded in hot springs and it has succeeded upon the cold snows of the North. You have so great a range of form and habit in insects that they give almost the most valuable material for the study of evolution, and form material most valuable for study, not only entomologically but also biologically. The same morphological type forms habits which seem little more than physical reactions to the environment, the vehicle of instincts which excite our bewildered imagination and of behaviour which recalls the questing intelligence of man. It is because you have this multiplicity of form and habit within a narrow range of morphological structure that insects have been so valuable a field for study of the modes of evolution. I am very glad you have not followed in every respect the advice of the great Westwood, who tried to persuade young entomologists not to be beguiled by attractive speculations of the Darwinian theory.

"Insects, I think, are the only branch of the Animal Kingdom which are capable of disputing the inheritance of the earth with mankind. I need not weary

you by reminding you of the insect vectors of disease, of the attacks that insects make upon our dwellings, upon our food and upon our plants. The presence here of representatives of Medicine, Hygiene and all the Government Departments dealing with Applied Entomology is sufficient evidence of the practical value of Entomology. But, while we rejoice in all this modern development, we should not forget, I think, that at the first meeting of your Society, certainly in the first volume of your Transactions, you described a scheme which you had developed for a system of prize essays on noxious enemies and the ways of combating them, so that, from the very beginning, you have had not only Entomology from its scientific side, but Entomology as it may conduce to the welfare of mankind, before your eyes.

" Professor Poulton, on behalf of the Delegates from the British Empire I wish to thank, through you, the Royal Entomological Society of London for its contribution to Systematic Zoology, for its contribution to the philosophical interests of Biology and for its contribution to the welfare of mankind. We congratulate you on your past, we rejoice with you in the present and we offer you our most confident hopes for the future."

(Acclamation.)

Prof. P. Lesne, on behalf of the Foreign Delegates, said :—" Monsieur le Président, My Lords, Mesdames, Messieurs, des circonstances fortuites me valent le très grand honneur de prendre aujourd'hui la parole au sein de cette solennelle réunion, au nom des délégués étrangers venus représenter leurs pays respectifs aux cérémonies du centenaire de l'Entomological Society of London. D'impérieuses raisons en ont écarté les plus éminentes personnalités.

" En se rendant ici, aussi nombreux qu'il leur a été possible, malgré les difficultés que traversent toutes les nations, les entomologistes étrangers sont venus exprimer en ce jour mémorable à la Société entomologique de Londres leurs plus vives félicitations et leurs voeux de prospérité les plus sincères au nom des corps constitués et des grands établissements scientifiques qu'ils représentent.

" Quelle plus belle manifestation d'activité entomologique pourrait-on citer que celle dont ont fait preuve les entomologistes britanniques ? Qui ne connait, pour les avoir consultés maintes fois, les Transactions et les Proceedings de votre association, ces précieuses sources de renseignements dont l'ensemble constitue un des plus grandioses monuments élevés à la science des Insectes.

" Quelle plus instructive leçon d'histoire que de parcourir vos bulletins. Notre pensée s'y reporte aux fondateurs de cette oeuvre, aux noms illustres qui ont imprimé un relief ineffaçable aux archives de votre Société, les Kirby, les Spence, les Westwood, les Stainton, les Curtis, les Sharp, les Wallace, et au grand nom de Darwin, qui fût des vôtres.

" Notre pensée se reporte vers ceux qui, au cours de tout un siècle, ont dirigé les travaux de votre communauté scientifique, à ceux qui y ont condensé le fruit de leur labeur, à ceux qui ont entretenu et perpétué sur le sol britannique le goût des recherches désintéressées.

" En ce jour évocateur d'un long passé de prospérité scientifique, nous leur apportons notre hommage, et nous adressons aux entomologistes britanniques qui poursuivent l'oeuvre si brillamment commencée, le témoignage le plus cordial de la haute estime dans laquelle nous tenons leurs travaux."

The following Delegates were then received individually by the President, to whom many of them presented Addresses :—

GREAT BRITAIN.

Armstrong College.
R. A. Harper Gray, M.A., M.Sc.

The Association of Economic Biologists.
Dr. A. D. Imms, M.A., Sc.D., F.R.S.
Prof. J. W. Munro, M.A., D.Sc.

The Birmingham Natural History and Philosophical Society.
C. J. Wainwright.

The Brighton and Hove Natural History and Philosophical Society.
J. S. North.

The Bristol Naturalists' Society.
Miss I. M. Roper, F.L.S.
J. V. Pearman.

The British Association for the Advancement of Science.
Sir John Russell, F.R.S.

The British Ecological Society.
Prof. E. J. Salisbury.

The British Museum (Natural History).
Dr. C. Tate Regan, M.A., Sc.D., F.R.S.
N. D. Riley, F.Z.S.

The British Mycological Society.
Prof. W. Brown.
J. Ramsbottom, O.B.E., M.A.

The British Science Guild.
A. Howard, C.I.E.

The Bureau of Hygiene and Tropical Diseases.
Sir Arthur Bagshawe, C.M.G.

The Burton-on-Trent Natural History and Archaeological Society
G. H. Storer, F.Z.S.

The Cardiff Naturalists' Society.
W. E. Cox.

The Conchological Society of Great Britain and Ireland.
Capt. Cyril Diver, M.A., F.R.G.S.

The Empire Marketing Board.
Malcolm MacDonald, M.P.
E. M. H. Lloyd.

The Entomological Society of the South of England.
Dr. B. N. Blood.
E. Rivenhall Goffe.
C. G. Johnson, B.Sc.
B. M. Hobby, M.A.

The Essex Field Club.
W. S. Gilles, F.I.C., F.C.S.
H. Main, B.Sc., F.Z.S.

The Forest Products Research Laboratory, Princes Risborough.
Dr. R. C. Fisher, B.Sc., Ph.D.

The Glasgow and Andersonian Natural History and Microscopical Society.
J. Richardson.

The Harper Adams Agricultural College.
E. E. Edwards, M.Sc.

The Hastings and St. Leonards Natural History Society.
Capt. T. Dannreuther, R.N.

The Imperial Bureau of Agricultural Parasitology.
Prof. R. T. Leiper, M.D., D.Sc., F.R.S.

The Imperial College of Science and Technology.
Prof. J. W. Munro, M.A., D.Sc.

The Imperial Forestry Institute, Oxford.
Dr. R. N. Chrystal, D.Sc.

The Imperial Institute.
Lieut.-Gen. Sir William Furse, K.C.B., D.S.O.

The Imperial Institute of Entomology.
Sir Guy A. K. Marshall, C.M.G., D.Sc., F.R.S.

The Imperial Mycological Institute.
Dr. E. J. Butler, C.M.G., C.I.E., F.R.S.

The John Innes Horticultural Institution.
Sir Arthur Hill, K.C.M.G., M.A., Sc.D., F.R.S.

The Linnean Society of London.
Dr. Hugh Scott, M.A., F.L.S.

The Lister Institute of Preventive Medicine.
Prof. A. E. Boycott, D.M., F.R.S.
Dr. J. A. Arkwright, F.R.S.

The Liverpool School of Tropical Medicine.
Prof. W. S. Patton, M.B.
Dr. A. M. Evans, D.Sc.

The London Natural History Society.
R. W. Robbins.

The London School of Hygiene and Tropical Medicine.
Dr. V. B. Wigglesworth, M.A., M.D.

The Malacological Society of London.
A. E. Salisbury, A.M.I.E.E.
A. Tindell Hopwood, M.Sc., F.L.S.

The Manchester Literary and Philosophical Society.
The Rev. George H. Carpenter, D.Sc., M.R.I.A.

The Molteno Institute for Research in Parasitology.
Dr. D. Keilin, Sc.D., F.R.S.
A. W. Rymer Roberts, M.A.

The Northamptonshire Natural History Society and Field Club.
C. F. Olney.
Rev. G. E. Jackson.

The Perthshire Natural History and Antiquarian Museums.
Prof. A. D. Peacock, M.Sc., D.Sc., F.R.S.E.

The Peterborough Natural History, Scientific and Archaeological Society.
W. T. Mellows, LL.B.
S. W. P. Pooles.
J. W. Bodger, F.L.S.

The Quekett Microscopical Club.
J. Milton Offord, F.R.M.S.

The Ray Society.
R. Adkin.

The Reading and District Natural History Society.
C. Runge.
F. W. Flattely.

Rothamsted Experimental Station.
Dr. C. B. Williams, M.A., Sc.D.

The Royal Botanic Gardens, Kew.
Sir Arthur Hill, K.C.M.G., M.A., Sc.D., F.R.S.

The Royal Empire Society.
W. G. Freeman.
Dr. V. B. Wigglesworth, M.A., M.D.

The Royal Geographical Society.
W. L. Sclater, M.A.

The Royal Horticultural Society.
Sir Arthur Hill, K.C.M.G., M.A., Sc.D., F.R.S.

The Royal Institution of Great Britain.
Lord Rothschild, D.Sc., F.R.S.

The Royal Microscopical Society.
Prof. W. A. F. Balfour-Browne, M.A., F.R.S.E.
Prof. E. Hindle, M.A., Sc.D., Ph.D.

The Royal Society.
Sir Guy A. K. Marshall, C.M.G., D.Sc., F.R.S.

The Royal Society of Edinburgh.
Prof. Sir T. Hudson Beare, B.Sc., F.R.S.E.
Dr. R. Stewart MacDougall, M.A., LL.D., D.Sc., F.R.S.E.

The Royal Society of Tropical Medicine and Hygiene.
Major E. E. Austen, D.S.O.

The Selborne Society.
Wilfred Mark Webb, F.L.S.

The Society for the Promotion of Nature Reserves.
Lord Rothschild, D.Sc., F.R.S.
Dr. G. F. Herbert Smith, M.A., D.Sc.

The South London Entomological and Natural History Society.
C. G. M. de Worms, M.A., D.I.C., M.B.O.U.
T. R. Eagles.

The Torquay Natural History Society.
Capt. S. T. Stidston, R.N.

The University of Aberdeen.
Prof. J. W. Munro, M.A., D.Sc.

The University of Birmingham.
Emeritus Prof. E. Wace Carlier, M.D., F.R.S.E.

The University of Cambridge.
Prof. J. Stanley Gardiner, M.A., F.R.S.
Dr. A. D. Imms, M.A., Sc.D., F.R.S.

The University College of North Wales, Bangor.
Dr. W. Maldwyn Davies, B.Sc., Ph.D.

The University of Durham.
J. Omer-Cooper, M.A., M.Sc.

The University of Edinburgh.
Dr. R. Stewart MacDougall, M.A., LL.D., D.Sc., F.R.S.E.

The University of Leeds.
Dr. Llewellyn Lloyd, D.Sc.

The University of Liverpool.
Prof. W. S. Patton, M.B.

The University of London.
Prof. J. W. Munro, M.A., D.Sc.

The University of Manchester.
Dr. H. W. Miles, M.Sc., Ph.D.

The University of Oxford.
Prof. G. D. Hale Carpenter, M.B.E., D.M.

The University of Reading.
W. E. H. Hodson, A.R.C.S., D.I.C.

The University of St. Andrews.
Prof. A. D. Peacock, M.Sc., D.Sc., F.R.S.E.

The University of Sheffield.
Dr. A. W. Pickard-Cambridge, M.A., D.Litt.

The Wellcome Bureau of Scientific Research.
C. M. Wenyon, C.M.G., C.B.E., M.B., F.R.S.

The Yorkshire Naturalists' Union.
J. M. Brown, B.Sc., F.L.S.
M. L. Thompson.

The Zoological Museum, Tring.
Lord Rothschild, D.Sc., F.R.S.

The Zoological Society of London.
Sir Peter Chalmers Mitchell, C.B.E., D.Sc., LL.D., F.R.S.

ANGLO-EGYPTIAN SUDAN.

The Wellcome Tropical Research Laboratories.
H. W. Bedford.

ARGENTINA.

Sociedad Entomologica Argentina.
Dr. K. Jordan, Ph.D., F.R.S.
Dr. F. W. Edwards, M.A., Sc.D.

Museo Nacional de Historia Natural.
Dr. F. W. Edwards, M.A., Sc.D.

AUSTRALIA.

The Linnean Society of New South Wales.
Commander J. J. Walker, M.A., R.N., F.L.S.

BELGIUM.

La Société Royale Zoologique de Belgique.
Prof. P. Brien.

BULGARIA.

Bulgarische Entomologische Gesellschaft.
Major P. P. Graves.

Konigliches Naturwissenschaftliches Institut.
Major P. P. Graves.

CANADA.

Department of Agriculture, Entomological Branch.
Dr. W. R. Thompson, Ph.D., D.Sc.

DENMARK.

Entomologisk Forening i København.
I. P. Kryger.

EGYPT.

The Ministry of Agriculture.
H. S. Soliman Effendi.

La Société Royale d'Agriculture.
F. C. Willcocks.
Said eff Bahgat.

La Société Royale Entomologique d'Egypte.
A. Alfieri.

FRANCE.

L'Institut National Agronomique.
Prof. P. Vayssière.

L'Institut National d'Agronomie Coloniale.
Prof. P. Vayssière.

L'Institut Pasteur, Paris.
Prof. E. Roubaud.

Le Muséum National d'Histoire Naturelle.
P. Lesne.
L. Berland.
Dr. L. Chopard.

La Société Entomologique de France.
Dr. L. Chopard.
L. Berland.

La Société Zoologique de France.
Dr. J. Millot.

Le Vivarium du Jardin des Plantes.
Dr. L. Chopard.

Les Lépidoptéristes de Paris.
F. le Cerf.

La Société de Biogéographie, Paris.
Prof. P. Vayssière.

GERMANY.

Deutsche Entomologische Gesellschaft.
J. E. Collin.

Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg.
Dr. E. Titschack.

HAWAII.

The Hawaiian Entomological Society.
Dr. R. C. L. Perkins, M.A., D.Sc., F.R.S.

The Hawaiian Sugar Planters' Association.
Dr. R. C. L. Perkins, M.A., D.Sc., F.R.S.

HOLLAND.

Nederlandsche Entomologische Vereeniging.
Dr. D. L. Uyttenboogaart.
Mrs. D. L. Uyttenboogaart.

INDIA.

The Bombay Natural History Society.
Brigadier W. H. Evans, C.S.I., C.I.E., D.S.O.

IRELAND.

The Belfast Naturalists' Field Club.
W. M. Crawford, B.A., F.Z.S.
Mrs. W. M. Crawford.

The Royal Dublin Society.
Prof. J. Bayley Butler, M.B.E., M.A., M.B.

The Royal Irish Academy.
Dr. R. F. Scharff, M.A.

The Royal Zoological Society of Ireland.
Rev. George H. Carpenter, D.Sc., M.R.I.A.

Trinity College, Dublin.
Prof. J. Brontë Gatenby, M.A., Ph.D., D.Sc.

University College, Dublin.
J. Carroll, M.Sc., D.I.C., A.R.C.Sc.I.

ITALY.

R. Laboratorio di Entomologia Agraria, Portici.
Dr. L. Masi.

Museo Civico di Storia Naturale, Genova.
Dr. L. Masi.

Società Entomologica Italiana.
Dr. L. Masi.

NEW ZEALAND.

The Cawthron Institute.
Sir Guy A. K. Marshall, C.M.G., D.Sc., F.R.S.

NORWAY.

Norsk Entomologisk Forening.
Dr. T. G. Munster.

Zoologiske Museum, Oslo.
Dr. T. G. Munster.

SPAIN.

El Museo Nacional de Ciencias Naturales.
Prof. C. Bolivar y Pieltain.
M. Sancher Arcas.

La Sociedad Espanola de Historia Natural.
Prof. C. Bolivar y Pieltain.

Sociedad Entomologica Espana.
Lord Rothschild, D.Sc., F.R.S.

SWITZERLAND.

Schweizerische Entomologische Gesellschaft.
Dr. R. Biedermann.

UNITED STATES OF AMERICA.

The Academy of Natural Sciences of Philadelphia.
Emeritus Prof. E. B. Poulton, M.A., D.Sc., F.R.S.

The American Association of Economic Entomologists.
Dr. E. C. Van Dyke.

The American Entomological Society.
Dr. K. Jordan, Ph.D., F.R.S.

The California Academy of Sciences.
Dr. E. C. Van Dyke.

The Cambridge Entomological Club.
Dr. G. Salt, Ph.D., D.Sc.

Cornell University.
J. Carroll, M.Sc., D.I.C., A.R.C.Sc.I.

The Entomological Society of America.
Dr. E. C. Van Dyke.

The Entomological Society of Washington.
Dr. W. R. Thompson, Ph.D., D.Sc., F.R.S

Harvard University.
Dr. G. Salt, Ph.D., D.Sc.

The Pacific Coast Entomological Society.
Dr. E. C. Van Dyke.

The University of California.
Dr. E. C. Van Dyke.

Monsieur Réné Oberthür, an honorary Fellow of the Society, was also present.

Addresses and messages of congratulation were also received from, or on behalf of, the following bodies :—

GREAT BRITAIN.

The Berwickshire Naturalists' Field Club.
The Chester Society of Natural Science.
The East Malling Research Station.

The Edinburgh Natural History Society.
Gonville and Caius College, Cambridge.
The Isle of Wight Natural History and Archæological Society.
The Liverpool Biological Society.
The Manchester Entomological Society.
The Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne.
The Royal Asiatic Society of Great Britain and Ireland.
The Royal Scottish Museum, Edinburgh.
The South Eastern Union of Scientific Societies.
The University College of Wales, Aberystwyth.
The University of Glasgow.

ALGERIA.

L'Institut Pasteur d'Algérie.

AUSTRALIA.

The Royal Society of New South Wales.
The Royal Society of Victoria.

AUSTRIA.

Österreichische Entomologen-Verein, Wien.
Naturhistorisches Museum, Wien.
Zoologisch-botanische Gesellschaft in Wien.

BELGIUM.

L'Académie Royale de Belgique.
L'Institut Agronomique de l'Etat, Gembloux.
Le Musée Royal d'Histoire Naturelle, Bruxelles.
La Société Entomologique de Belgique.
La Société Royale des Sciences de Liège.
L'Union des Entomologistes Belges.

BRAZIL.

Instituto Biologico de Defesa Agricola e Animal, Sao Paulo.
Instituto Oswaldo Cruz, Rio de Janeiro.

CANADA.

The Entomological Society of British Columbia.

CHINA.

Entomological Laboratory, College of Agriculture, University of Chekiang.

CZECHOSLOVAKIA.

Societas Entomologica Čzechoslovenica.

DENMARK.

Universitetets Zoologiske Museum, København.

EGYPT.

The Egyptian University.

FINLAND.

The Entomological Society of Helsingfors.

FRANCE.

L'Institut de France, Académie des Sciences.
La Station Entomologique de Paris.

GERMANY.

Biologische Reichsanstalt für Land-und-Forstwirtschaft, Berlin.
Entomologische Gesellschaft e.V., Halle.
Entomologischer Verein " Iris."
Entomologischer Verein zu Stettin.
Gesellschaft Naturforschender Freunde zu Berlin.
Internationaler Entomologischer Verein e.V., Frankfurt.
Naturhistorische Verein der Preussischen Rheinlande und Westfalens.
Preussische Akademie der Wissenschaften.
Staatliche Museen für Tierkunde und Völkerkunde, Dresden.

HOLLAND.

The Entomological Laboratory, University of Wageningen.

IRELAND.

The Queen's University of Belfast.

ITALY.

Consiglio Nazionale delle Ricerche.
Museo Entomologico " Pietro Rossi."
Pontificia Accademia delle Scienze i " Nuovi Lincei."
The Zoological Museum, University of Naples.

JAPAN.

The National Research Council of Japan.
The Ohara Institute for Agricultural Research.

LUXEMBOURG.

La Société des Naturalistes Luxembourgeois.

MEXICO.

Instituto de Biologia.

MOROCCO.

L'Institut Scientifique Chérifien.

NEW ZEALAND.

The New Zealand Institute.

POLAND.

The Entomological Institute, University of Poznan.
Le Musée Zoologique Polonais.
The Polish Entomological Society.

RUSSIA.

The Entomological Society of the Soviet Union.
The Science Department of the Central Executive Committee of the Union of Soviet Socialist Republics.
The Zoological Institute of the Academy of Sciences, Leningrad.

SPAIN.

Academia de Ciencias y Artes de Barcelona.

SWEDEN.

The Royal Swedish Academy of Science.
Statens Skogsforsoksanstalt, Experimentalfaltet.

SWITZERLAND.

La Société de Physique et d'Histoire Naturelle de Genève.

TASMANIA.

The Royal Society of Tasmania.

UNITED STATES OF AMERICA.

The American Museum of Natural History.
The Boston Society of Natural History.
The Bureau of Entomology, Washington.
The Carnegie Museum.
The Connecticut Agricultural Experiment Station.
The Department of Tropical Medicine, Harvard University Medical School.
The Kansas Entomological Society.
The New York Entomological Society.
The Peabody Museum of Natural History.
The Smithsonian Institution.
The United States National Museum.

Letters, telegrams, and other messages of congratulation were also received from Sr. Ignacio Bolivar, Madrid, Prof. R. Gestro, Genoa, Dr. Walther Horn, Berlin, Dr. L. O. Howard, Washington, U.S.A., Prof. A. Lameere, Brussels, Dr. Paul Marchal, Paris, Prof. A. P. Semenoff Tian-Shanski, Leningrad, and Prof. F. Silvestri, Portici, Honorary Fellows ; Prof. R. Newstead, Special Life Fellow ; and Prof. E. L. Bouvier, Mr. A. N. Burns, Mr. H. J. Carter, Dr. J. Davidson, Mr. A. H. Elston, Mr. J. W. Evans, Dr. C. J. Gahan, Mr. W. B. Gurney, Mr. R. Kelly, Mr. G. Lyell, Mr. A. Musgrave, Mr. L. J. W. Newman, Mr. A. J. Nicholson,

Miss J. Raff, Dr. H. Schouteden, Dr. B. N. Schwanwitsch, Dr. E. Sergent; Dr. R. J. Tillyard, Dr. A. J. Turner, Mr. R. Veitch, Dr. G. A. Waterhouse, Mr. F. E. Wilson, and Mr. H. Womersley.

The President: "Before we close this historic meeting, I wish to propose a hearty vote of thanks to the Royal Geographical Society for their generosity in lending us this room."

(The resolution was passed with acclamation.)

The Hon. Secretary requested all the delegates present to sign the special book which had been prepared for the occasion and which, it was hoped, would be a historic volume.

In the evening a further meeting was held at 41, Queen's Gate, which took the form of a conversazione at which exhibits were made by:—Rothamsted Experimental Station (Dr. C. B. Williams); the Committee for the Protection of British Insects (Mr. H. M. Edelsten); Dr. W. H. Thorpe; Mr. H. Main; Mr. G. H. Mansbridge; Mr. S. Maulik; the Imperial Institute of Entomology (Mr. B. P. Uvarov); the Zoological Museum, Tring (Dr. K. Jordan, F.R.S.); Dr. H. Scott; Dr. D. S. MacLagan; Dr. A. F. Rosa; Mr. Ray Palmer; Dr. E. A. Cockayne; the Ministry of Agriculture, Plant Pathological Laboratory, Harpenden (Mr. J. C. F. Fryer); Mr. C. G. M. de Worms; Mr. L. C. Bushby; Mr. H. St. J. K. Donisthorpe; Prof. E. B. Poulton, F.R.S.; Mr. L. W. Newman; Prof. G. D. Hale Carpenter; the London School of Hygiene and Tropical Medicine (Dr. V. B. Wigglesworth, Mr. H. S. Leeson, Mr. J. D. Gillett); the Imperial Institute of Entomology, Farnham House Laboratory (Dr. W. R. Thompson, F.R.S., Mr. E. Cameron, Mr. S. Garthside, Mr. K. R. S. Morris, Mr. J. E. Moss); the Imperial College of Science, Biological Field Station (Mr. G. V. B. Herford, Mrs. O. W. Richards, Dr. A. B. T. Page); and Dr. H. Eltringham, F.R.S.

On the afternoon of the 4th May the delegates were received by Lord Crawford and Balcarres, on behalf of the Trustees of the British Museum at a reception in the Natural History Museum, and in the evening of the same day were entertained at dinner in the Gardens of the Zoological Society of London, by kind permission of the President and Council.

On the 5th May the Overseas Delegates took part in an excursion to the Zoological Museum, Tring, by courtesy of Lord Rothschild, and then visited the Zoological Park, Whipsnade, where they were entertained to luncheon.

In the evening Delegates and Fellows of the Society were received by the Right Hon. Walter Elliot, M.C., M.P., Minister of Agriculture and Fisheries, on behalf of His Majesty's Government, at a Reception at Lancaster House, St. James's.

ADDRESSES PRESENTED AT THE CENTENARY MEETING

GREAT BRITAIN.

Birmingham Natural History and Philosophical Society.

The BIRMINGHAM NATURAL HISTORY AND PHILOSOPHICAL SOCIETY, founded in 1858, and now incorporating the BIRMINGHAM ENTOMOLOGICAL SOCIETY, originally separately established in 1888, desires to offer very sincere felicitations to the Officers and Fellows of the ENTOMOLOGICAL SOCIETY OF LONDON upon the successful completion of its first century of existence, and to express its appreciation of the honour of having been invited to send delegates to join with them in the celebration of this important event.

In the course of its hundred years of life and labour the ENTOMOLOGICAL SOCIETY OF LONDON has included on its rolls of Members and Fellows the names of many distinguished men, of whom a considerable number have attained great distinction in their own special subjects. It has also published with their assistance a great series of Transactions, which constitutes in itself an outstanding monument to the value and importance of the Society's activities.

The BIRMINGHAM NATURAL HISTORY AND PHILOSOPHICAL SOCIETY desires to offer its congratulations on this successful accomplishment and to record its satisfaction in the knowledge that, in this period when the study of entomology is at last coming into its own, not only as a field for the study of pure science, but for its importance in connection with so many matters of practical concern, its care is in the hands of a Society with so fine a tradition and such an excellent equipment for the future.

Bristol Naturalists' Society.

The Council and Members of the

BRISTOL NATURALISTS' SOCIETY

convey warmest felicitations to the Council and Fellows of the

ENTOMOLOGICAL SOCIETY OF LONDON

on the occasion of the celebration of the ENTOMOLOGICAL SOCIETY'S centenary.

In congratulating the Society on its achievements in the advancement of Entomological Science and on the eminence it has attained among scientific societies, there are also expressed the most sincere wishes for the long continuance of its prosperity and influence.

On behalf of the BRISTOL NATURALISTS' SOCIETY,

F. S. WALLIS, *President.*
IDA M. ROPER, *Hon. Secretary.*

3*rd May* 1933.

British Association for the Advancement of Science.

TO the President and Council of the

ENTOMOLOGICAL SOCIETY
OF LONDON

May 3, 1933

The Council of the BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE offer cordial congratulations to the President and Council of the ENTOMOLOGICAL SOCIETY OF LONDON, on the occasion of their Centenary celebration.

The Council recall that the Society was founded only two years later than the BRITISH ASSOCIATION, at a period of intellectual activity which concentrated through various channels upon the strengthening and extension of the pursuit of learning. The Council gratefully acknowledge the co-operation of the Society and remember with satisfaction that it is a Society in correspondence with the Association.

It is the earnest hope of the Council that the Society may flourish and prosperously increase its labours for the Advancement of Entomological Knowledge.

F. GOWLAND HOPKINS.
President.

Burlington House,
London.

Trustees of the British Museum.

THE TRUSTEES OF THE BRITISH MUSEUM GREET THE ENTOMOLOGICAL SOCIETY OF LONDON

and congratulate it on the celebration
of the first century of its existence.

The relations between the Society and the Museum have from the beginning been very close. It was, indeed, within the precincts of the Museum building at Bloomsbury that the Society was founded precisely one hundred years ago on the third day of May. Since that distant time the Trustees have watched with a benevolent interest the Society's deliberations and manifold activities, in all of which the Staff in charge of the unrivalled collection of insects in the Museum have taken their part. The Trustees feel therefore very real pleasure in extending to the Society their cordial good wishes for the continual enlargement of its activities and increase of its prosperity.

The Society's disinterested achievement in the improvement and diffusion of entomological science is a subject too vast to be stated in detail here. Ample testimony is borne to it by the long and uninterrupted sequence of the Transactions and Proceedings which record almost entirely the work of the past and present Fellows of the Society, numbering in all 2306. In substance the numerous contributions thus published have been devoted mainly to taxonomy or some other aspect

of pure entomology; had the Society directed its energy with equal vigour and persistence to the fostering of applied entomology, as, indeed, appears to have been the intention of its founders, it is not impossible that the development within the British Empire of this most important branch of entomology would have been profoundly different.

In witness hereof the Corporate Seal of the
TRUSTEES OF THE BRITISH MUSEUM is attached
this thirteenth day of May in the year of
Our Lord one thousand nine hundred and
thirty-three in the presence of
COSMO CANTUAR:

British Mycological Society.

THE BRITISH MYCOLOGICAL SOCIETY
conveys hearty congratulations and greetings to
THE ENTOMOLOGICAL SOCIETY OF LONDON

on the occasion of its centenary, with an expression of admiration for the solid contributions to science made by its Fellows during the hundred years of its existence.

The two Societies have many interests in common, for insects and fungi are of the greatest economic importance. Occurring often together, it is necessary to study both in order to understand the problems of prevention and treatment. Moreover, the investigation of fungi parasitic on insects has not only provided a wide field for taxonomic work in mycology, but has led to the devising of methods with a view to insect control. A further common interest is centred in the symbiosis which exists between insects and fungi of several groups.

The members of the younger Society, therefore, have a peculiar interest in the welfare of the ENTOMOLOGICAL SOCIETY, and it is their earnest wish that its future progress and achievements may be of a magnitude commensurate with its illustrious history.

W. BROWN, *President.*
J. RAMSBOTTOM, *Secretary.*

Conchological Society of Great Britain and Ireland.

ADDRESS
from the
CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND
presented on behalf of
The PRESIDENT and MEMBERS
by
CAPTAIN CYRIL DIVER.

The PRESIDENT and MEMBERS of the CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND beg leave to offer their most cordial con-

gratulations to the ENTOMOLOGICAL SOCIETY OF LONDON on the auspicious occasion of its centenary.

The advance and diffusion of Natural Knowledge are the guiding principles that inform the work of both Societies in their respective spheres, and it is with pride that the CONCHOLOGICAL SOCIETY numbers itself among those gathered to do honour to a long record of scientific achievement.

The CONCHOLOGICAL SOCIETY sincerely trusts that the ENTOMOLOGICAL SOCIETY may for very many years continue its distinguished services to Science and Humanity.

Empire Marketing Board.

To the President, Officers and Members of the Council of the
ROYAL ENTOMOLOGICAL SOCIETY OF LONDON.

In conveying cordial congratulations to the ROYAL ENTOMOLOGICAL SOCIETY OF LONDON on the occasion of its Centenary celebrations, the EMPIRE MARKETING BOARD desires to express its high appreciation of the important and distinguished services rendered by the Society to the cause of entomological science.

In the short period of its existence the EMPIRE MARKETING BOARD has sought and obtained the expert advice and whole-hearted co-operation of many of your foremost members in its endeavours to promote and intensify the Empire-wide campaign against insect pests attacking crops, foodstuffs and agricultural raw materials, and it is deeply conscious of the vast debt due to the pioneering and indefatigable researches of past and present members of your Society in enabling new and effective methods of insect eradication to be evolved and applied in the interests of human welfare and economic betterment.

MALCOLM MACDONALD.
E. M. H. LLOYD.

2, *Queen Anne's Gate Buildings,*
London, S.W. 1.
May 2nd 1933.

Entomological Society of the South of England.

An Address
presented to the
ENTOMOLOGICAL SOCIETY OF LONDON
upon the occasion
of its
Centenary Celebrations
3rd–5th May 1933
from the
ENTOMOLOGICAL SOCIETY OF THE SOUTH OF ENGLAND

The ENTOMOLOGICAL SOCIETY OF THE SOUTH OF ENGLAND offers to the President and Fellows of the ENTOMOLOGICAL SOCIETY OF LONDON

its heartiest congratulations on the attainment of their first Centenary, and desires to express its appreciation of the honour conferred upon it by having been invited to send delegates to join with them in the celebration of this important event.

With you we look back with pride at the leading part which Fellows of the London Society have taken in the immense strides made in the study of Entomology during the past century, and to the splendid series of Transactions which you have given to the scientific world—a monument for all time to their labours in the pursuit of knowledge.

The esteem in which the ENTOMOLOGICAL SOCIETY OF LONDON is held throughout the world is reflected in its long list of Fellows from outside the British Isles; it would indeed be difficult to name a Country which has not at some time or other contributed at least one Fellow to its ranks, and there can be few districts left whose entomological fauna has not provided material for your publications at least once during the past hundred years.

With such a splendid record to your credit for the past century you can indeed face the future with confidence and we can offer you no better wish than that your second hundred years may be as outstandingly successful as your first.

B. N. BLOOD.
President.
E. RIVENHALL GOFFE.
Honorary Secretary.

102, *High Street,*
Southampton.

Essex Field Club.

In the name and on behalf of the ESSEX FIELD CLUB we have the pleasure to offer our heartiest congratulations to the ENTOMOLOGICAL SOCIETY OF LONDON on the attainment of its first centenary.

For one hundred years the Entomological Society has been the premier association of persons engaged in the study of the Insecta and its allies—animals whose economic importance to man is now realised as being second to that of no other Class of living creatures, and whose intimate structure and habits present scientific problems whose interest and fascination are unexcelled in the whole realm of Nature.

We venture to hope that the ENTOMOLOGICAL SOCIETY OF LONDON may flourish in the future even more than during the first century of its existence, and that the useful study with which it is occupied may receive ever more sympathetic consideration and approval from persons in authority, in its constant endeavours to discover and control the life-habits of creatures responsible for so many of the diseases and inconveniences from which man suffers.

WILLIAM E. GLEGG
President.
PERCY THOMPSON
Hon. Secretary.

The Essex Museum of Natural History,
Romford Road, Stratford, Essex, E. 15.

Imperial Bureau of Agricultural Parasitology.

To the
ENTOMOLOGICAL SOCIETY OF LONDON
from the
IMPERIAL BUREAU OF AGRICULTURAL PARASITOLOGY
GREETING.

SINCE MANSON'S discovery, more than half a century ago, that a Blood-sucking Insect was essential for the transmission of an important Helminth disease of man, progress in the control of many Helminth parasites of Economic Importance has been dependent on Advances in the Science of Entomology.

IN these Advances your Society notably shared.

HEARTIEST Congratulations are tendered on the Centenary of its Foundation.

R. T. LEIPER.
Director.

Imperial Institute.

The IMPERIAL INSTITUTE, mindful of the interest officers of the ENTOMOLOGICAL SOCIETY OF LONDON have more than once shown in the work of the Institute's Advisory Committee on Sericulture and grateful for the assistance members of the Society readily render the Institute in connection with its various activities, has the honour of offering the Society most cordial congratulations on the occasion of the celebration of the Centenary of its foundation and of expressing most sincere wishes for the Society's continued welfare and renown.

W. T. FURSE.
Director.

May 3rd 1933.

Imperial Institute of Entomology.

To the
ENTOMOLOGICAL SOCIETY OF LONDON.
The Chairman and Directorate of the
IMPERIAL INSTITUTE OF ENTOMOLOGY,
on behalf of the Honorary Committee of Management,
offer to the
ENTOMOLOGICAL SOCIETY OF LONDON

their most sincere and hearty congratulations on the occasion of her Hundredth Anniversary and rejoice at this opportunity of emphasising the close and amicable relations that exist between them.

BUXTON.
Chairman.
GUY A. K. MARSHALL.
Director.

London,
May 1933.

Linnean Society of London.

THE LINNEAN SOCIETY OF LONDON

conveys hearty congratulations to

THE ENTOMOLOGICAL SOCIETY OF LONDON

on the hundredth anniversary of its foundation, and desires to express sincere appreciation of the results attained by its distinguished body of workers, whose studies have enriched and enlarged the common stock of knowledge.

The interests which the two Societies have in common are many. As the custodian of the collection of insects formed by CARL VON LINNÉ, the LINNEAN SOCIETY has ever been mindful of the importance of Entomology, and in its publications has contributed to the advancement of entomological knowledge.

In the past many distinguished naturalists have been Fellows of both Societies. Among former Fellows of the LINNEAN SOCIETY were CHARLES DARWIN, J. O. WESTWOOD, C. C. BABINGTON and the REV. W. KIRBY, all of whom were Foundation Fellows of the ENTOMOLOGICAL SOCIETY, while SIR JOHN LUBBOCK, H. W. BATES and ALFRED RUSSEL WALLACE were among that Society's Presidents. Prominent among living entomologists stands the honoured name of E. B. POULTON, Centenary President of the ENTOMOLOGICAL SOCIETY and a former President of the LINNEAN SOCIETY.

That THE ENTOMOLOGICAL SOCIETY OF LONDON may flourish in the future as in the past, and that its illustrious record may be still further enhanced, is the earnest desire of The LINNEAN SOCIETY OF LONDON, whose Common Seal is hereto affixed this twenty-seventh day of April 1933.

F. E. WEISS. *President.*
J. RAMSBOTTOM. *Secretaries.*
STANLEY KEMP.

Lister Institute of Preventive Medicine.

To the

ENTOMOLOGICAL SOCIETY

of

LONDON

on the occasion of its Centenary Commemorations

May 1933.

The governing body and scientific staff of the LISTER INSTITUTE OF PREVENTIVE MEDICINE extend their cordial congratulations to THE ENTOMOLOGICAL SOCIETY OF LONDON on attaining its centenary year and welcome the opportunity of taking part in the coming celebrations through their appointed delegates.

While fully cognisant of the importance of entomological research for its own sake, they would desire to emphasise the enormous practical value of the study

in its bearing on animal and plant pathology and on the natural history of insect-borne disease. They would recall in this connection the participation of Institute workers in elucidating the transmission of bubonic plague from rat to man and in particular the achievements in many fields of experimental entomology of their late colleague and Fellow of the Entomological Society, ARTHUR BACOT, who met his death from typhus fever while engaged in the study of its insect-vector relationships.

In other spheres of medical entomology they would recall the work of their late Chairman, SIR DAVID BRUCE, and also that of the late PROFESSOR MINCHIN.

The problems of insect-borne disease that yet remain to be solved by the experimental entomologist are many, and it is the earnest hope of the LISTER INSTITUTE OF PREVENTIVE MEDICINE that the work, influence and patronage of THE ENTOMOLOGICAL SOCIETY OF LONDON may ever prove a source of inspiration to fresh triumphs in this great field.

WILLIAM BULLOCH.
Chairman of the Governing Body.

J. C. G. LEDINGHAM.
Director.

The Lister Institute of Preventive Medicine,
London, May 1933.

London Natural History Society.

THE LONDON NATURAL HISTORY SOCIETY
offers cordial greetings and its most sincere congratulations
to the President, Council and Fellows of
THE ENTOMOLOGICAL SOCIETY OF LONDON,

on the completion of the first century of the Society's existence. All who follow the progress of scientific knowledge know how deeply the world is indebted to THE ENTOMOLOGICAL SOCIETY OF LONDON for the work which it has done to advance the science of entomology, and to bring it to an important position in the eyes of Governments and People of the Empire and of the world.

THE LONDON NATURAL HISTORY SOCIETY is proud to think that it is now and has long been linked to THE ENTOMOLOGICAL SOCIETY OF LONDON through several of its members, which the two Societies share in common, and that the first Lady President of THE LONDON NATURAL HISTORY SOCIETY is also the first Lady Councillor of THE ENTOMOLOGICAL SOCIETY OF LONDON. THE LONDON NATURAL HISTORY SOCIETY offers its congratulations with the confident expectation that the century on which THE ENTOMOLOGICAL SOCIETY OF LONDON has now entered, will be even more fruitful than that which has passed.

CYNTHIA LONGFIELD.
President London Natural History Society.

3*rd May* 1933.

London School of Hygiene and Tropical Medicine.

To

THE ENTOMOLOGICAL SOCIETY OF LONDON

on the occasion

of the Centenary of their Foundation

THE LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

send

Greeting

Our knowledge of those insects which assail the health of man is founded upon the pure science of Entomology.

For one hundred years the Welfare of this Science has been your interest and care.

May your labours continue to bear fruit not less beneficent than the past century has witnessed.

The Seal of the School was affixed hereto, this Twenty-fifth day of April 1933, in the presence of

W. W. JAMESON. *Dean.*
R. W. HARRIS. *Secretary.*

Malacological Society of London.

THE MALACOLOGICAL SOCIETY OF LONDON

sends Greetings to

THE ENTOMOLOGICAL SOCIETY

on the occasion of the Centenary of its Foundation; and wishes to the ENTOMOLOGICAL SOCIETY a long and prosperous future of continued valuable work, for the Benefit of Humanity and the Furtherance of Scientific Knowledge.

ALBERT E. SALISBURY
President.

Manchester Literary and Philosophical Society.

To the ENTOMOLOGICAL SOCIETY OF LONDON

The President, Officers, Council and Members of the MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY desire to express to their colleagues of the ENTOMOLOGICAL SOCIETY OF LONDON their hearty congratulations on the occasion of that Society's Centenary Celebration and to record their high appreciation of the invaluable service which its Fellows have rendered in elucidating many and diverse problems in the structure, classification, development and bionomics

of Insects. The ENTOMOLOGICAL SOCIETY has become a live centre of research for the whole British Commonwealth, and students of the subject, throughout the Homeland and the Dominions, look to it for leading and encouragement in their own efforts.

As the MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY attained its hundred and fiftieth anniversary just two years ago its members are able to share with understanding in the present noteworthy celebration, and they are glad to send as their Delegate one of their number who is also a Fellow of the ENTOMOLOGICAL SOCIETY. They confidently hope that the years to come will be even more fruitful than those past, in observations and experiments which will widely enlarge our knowledge of the ways of insects in all quarters of the world, and will incidentally help to advance the industries, the health and the well-being of mankind.

JOHN ALLAN.
President.

May 3rd 1933.

Natural History Society of Northumberland, Durham and Newcastle upon Tyne.

TO THE PRESIDENT AND COUNCIL
OF THE
ENTOMOLOGICAL SOCIETY OF LONDON.

May 3rd 1933.

Gentlemen,

The President, Council and Members of the NATURAL HISTORY SOCIETY OF NORTHUMBERLAND, DURHAM AND NEWCASTLE UPON TYNE offer their cordial congratulations to the Council of the ENTOMOLOGICAL SOCIETY OF LONDON upon the attainment of its Jubilee, an important event in its honourable history.

The Society can look back upon a record of great achievements in the advancement of scientific knowledge, particularly in the realm of economic entomology, a branch of science which steadily increases in its scope and has become of world-wide importance. The centenary affords an opportunity for bringing into contact the workers in this field from many countries.

This Society would add their congratulations and express their heartfelt wish that the ENTOMOLOGICAL SOCIETY may long continue successfully to carry on the useful work which has been done in the past.

GREY OF FALLODON.
President.

C. E. ROBSON.
GEORGE W. TEMPERLEY.
Honorary Secretaries.

T. RUSSELL GODDARD.
Curator.

Hancock Museum,
Newcastle upon Tyne.

Perthshire Society of Natural Science.

THE PERTHSHIRE NATURAL HISTORY AND ANTIQUARIAN MUSEUMS.

Sirs,

The PERTHSHIRE SOCIETY OF NATURAL SCIENCE convey to the President, Officers and Members of the ENTOMOLOGICAL SOCIETY OF LONDON their congratulations on a successful existence of 100 years.

The work which has been done in the past has been a credit to the workers of your Society, and this Society expresses the wish that that work may long continue and be a source of fruitfulness to the scientific world.

One of our members is to have the privilege of conveying this address to you in the person of Professor A. D. PEACOCK.

By Order of the Council,
Perthshire Society of Natural Science,

President.
EDWARD SMART.

Honorary Secretary.
JOHN RITCHIE.

The Museum, Tay Street,
Perth, 29th April 1933.

Rothamsted Experimental Station.

1833–1933

To

The President and Council

of the

ENTOMOLOGICAL SOCIETY OF LONDON

The Committee and Staff of the ROTHAMSTED EXPERIMENTAL STATION desire to present to the President and Council of the ENTOMOLOGICAL SOCIETY OF LONDON their cordial greetings and sincerest congratulations on the attainment of the Society's Centenary.

Agriculturists in all parts of the world are deeply indebted to the science of entomology for the knowledge now gained about the insect pests which so often render nugatory their best attempts to improve crops and livestock, and in tropical countries cause discomfort and even danger to their own lives. Thanks to the devoted labours of entomologists, working often under trying conditions, the insect menace is being brought more and more under control and no important scheme of agricultural development would now be initiated without first providing for adequate treatment of the entomological problems involved.

In the remarkable developments of entomological science during the past hundred years the ENTOMOLOGICAL SOCIETY OF LONDON has played a most distinguished part. It has promoted meetings and discussions for the interchange of knowledge and of opinions: it has assisted in the dissemination of the results of

entomological investigations and through its constant insistence on the dignity and importance of the subject it has done much to raise entomology to the high position it now occupies in the Universities and State Councils of the World.

It is our earnest hope that the Society may continue to prosper and to maintain and even extend the beneficent work on which it has been so long and so fruitfully engaged.

Signed.

E. J. RUSSELL.

Director of the Rothamsted Experimental Station.

C. B. WILLIAMS.

Head of the Entomological Laboratories.

May 3rd 1933.

Royal Botanic Gardens, Kew.

The Director and Staff
of the
ROYAL BOTANIC GARDENS, KEW
desire to offer their cordial congratulations
to the
ENTOMOLOGICAL SOCIETY OF LONDON
on the achievement of the
Centenary
of its valuable existence.

Entomologists are both loved and feared by their Botanical and Horticultural colleagues, for, on the one hand we owe to the Insect World the fertilization of our flowers while, on the other hand, many of our most dreaded plant diseases are caused or propagated by Insects.

We trust your Society may prosper in the future and extend its important work for the benefit of mankind.

ARTHUR W. HILL.

Director.

May 3rd 1933.

Royal Empire Society.

ADDRESS

To the President and Council of the ENTOMOLOGICAL SOCIETY OF LONDON

The Council and Fellows of the ROYAL EMPIRE SOCIETY welcome this occasion of the Centenary Celebration of the ENTOMOLOGICAL SOCIETY OF LONDON to tender their great appreciation of the work accomplished by the Society in promoting the advancement and diffusion of Entomological science.

The Society's activities have necessarily been largely in the realm of pure science.

Man has to wage ceaseless war, however, against the hordes of insect pests which prey upon his crops and stock and may even threaten his very existence.

To the ENTOMOLOGICAL SOCIETY is due the credit of having been a very early pioneer in endeavouring to foster the application of entomological results to agricultural practice, the vital importance of which is now recognised by all civilised communities.

It is the earnest hope of the ROYAL EMPIRE SOCIETY that the valuable work performed by the ENTOMOLOGICAL SOCIETY OF LONDON during the past century may be long continued and be of ever increasing benefit to the Empire and the whole world.

ARCHIBALD WEIGALL.
Chairman of Council, Royal Empire Society.

H. SEMPILL.
The Master of Sempill.

GEORGE PILCHER.
Secretary, Royal Empire Society.

Delegates of the Royal Empire Society to the Centenary Celebrations of the Entomological Society of London :

W. G. FREEMAN.
V. B. WIGGLESWORTH.

Royal Geographical Society.

The Council and Fellows of the
ROYAL GEOGRAPHICAL SOCIETY
send Greetings and Congratulations to the
ENTOMOLOGICAL SOCIETY OF LONDON

on the Hundredth anniversary of their Foundation and hope that they may continue to enjoy prosperity and success in promoting the study of their Science which has of late become increasingly important to the welfare of the Human Race by the valuable economic results of its studies in the transmission of human diseases and the control of insect pests.

An ancient bond between our two Societies was HENRY WALTER BATES, the naturalist of the Amazons, who from 1864 to 1892 was Secretary of the ROYAL GEOGRAPHICAL SOCIETY and was twice in that period chosen President of the ENTOMOLOGICAL SOCIETY. And now it is a great satisfaction to the ROYAL GEOGRAPHICAL SOCIETY that they are able to place their Hall at the disposal of the ENTOMOLOGICAL SOCIETY for the present ceremony.

Given at the House of the
Society in Kensington Gore

1 *May* 1933.

W. E. GOODENOUGH.
President.

TOM G. LONGSTAFF.
W. L. SCLATER.
Honorary Secretaries.

ARTHUR R. HINKS.
Secretary.

Royal Horticultural Society.

On behalf of the Fellows of the
ROYAL HORTICULTURAL SOCIETY
the Council desire to offer cordial congratulations
to the
ENTOMOLOGICAL SOCIETY OF LONDON

on completion of the first hundred years of its existence and desire to express their appreciation of that Society's achievements. They pray that it will continue in prosperity and ever extend its work for the use and benefit of mankind.

HENRY D. MCLAREN.
President.
F. R. DURHAM.
Secretary.

25*th April* 1933.

Royal Society of Edinburgh.

TO THE
ENTOMOLOGICAL SOCIETY
OF LONDON
THE ROYAL SOCIETY OF EDINBURGH SENDS GREETING.

THE ENTOMOLOGICAL SOCIETY began life at a time when it was seen that the sciences must diverge, if they were to cover their field; and accordingly each man of science selected the subject that claimed his special affection, without any direct consideration of its utility or importance. Those who founded the ENTOMOLOGICAL SOCIETY chose perhaps the smallest and perhaps the most varied and certainly not the least wonderful of the works of Nature; and time has justified their choice. What they took up as merely wonderful, is now seen to be of the highest practical importance. One cannot overstate the degree in which insects influence or even govern man and his interests and the other creatures and fruits upon which he depends, so that while the rest of the world can be reduced to subjection, insects pursue their own course, and the outcome of any contest is still doubtful.

The ROYAL SOCIETY OF EDINBURGH cannot claim to have contributed directly to the advancement of Entomology, except in the general way that it embraces all science. Yet two of its Honorary Fellows, CHARLES DARWIN and ALFRED RUSSEL WALLACE, both eminent as entomologists, may be said to form a link. And on the present occasion it has the privilege of transmitting its felicitations on the 100th Anniversary of the ENTOMOLOGICAL SOCIETY by the hand of two of its Fellows, themselves well known as entomologists, whose signatures are attached below.

In the name and by authority of the Council

E. SHARPEY SCHAFER *President.*
R. A. SAMPSON *General Secretary.*
R. STEWART MACDOUGALL
T. HUDSON BEARE *Representatives.*

May 1933.

Royal Society of London.

THE ROYAL SOCIETY OF LONDON
sends greetings and congratulations
to the
ENTOMOLOGICAL SOCIETY
on the completion of 100 years of
its valuable work for science and
hopes that the Society may have many
years before it of growing success
and activity for the enrichment of
human knowledge.

F. GOWLAND HOPKINS.
President.

Royal Society of Tropical Medicine and Hygiene.

To the
ENTOMOLOGICAL SOCIETY OF LONDON
On the Occasion of its Centenary.
1833–1933

THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE is glad to have the opportunity of tendering its congratulations to THE ENTOMOLOGICAL SOCIETY OF LONDON on this notable occasion in its long and distinguished history, and in so doing the younger Society recalls with satisfaction the important part played by entomologists in connection with those subjects with which it is especially concerned. The great discoveries of MANSON in filariasis, ROSS and GRASSI in malaria, BRUCE in trypanosomiasis, THEOBALD SMITH and KILBORNE in piroplasmosis, REED, CARROLL, and AGRAMONTE in yellow fever, SIMOND and MARTIN and BACOT in plague, ROSS and MILNE in relapsing fever, CHARLES NICOLLE in typhus and many others had in each case an entomological basis, in that the diseases in question are spread by those invertebrates which are the special study of entomologists throughout the world. It is to entomological specialists that medical men in the tropics look for information as to the identity, life history and bionomics of insect vectors of disease in man and animals, in order that with the help of such information, measures for the suppression of these vectors may be formulated. Measures of this kind are among the most effective weapons in the campaign against tropical disease, the object of which is to render habitable, both for the white man and the native, large areas of the tropics at present notoriously unhealthy. Already considerable progress has been made, and it is very largely on this account that THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE feels a special kinship with THE ENTOMOLOGICAL SOCIETY OF LONDON, and is honoured by the invitation to take part in these Centenary Celebrations.

G. CARMICHAEL LOW. *President, Royal Society of Tropical Medicine and Hygiene.*

3rd May 1933.

Society for the Promotion of Nature Reserves.

FROM

THE SOCIETY FOR THE PROMOTION OF NATURE RESERVES

TO THE ENTOMOLOGICAL SOCIETY OF LONDON

GREETINGS

On the occasion of the celebration of the Centenary of the inception of the ENTOMOLOGICAL SOCIETY OF LONDON the Council of the SOCIETY FOR THE PROMOTION OF NATURE RESERVES extend to the ENTOMOLOGICAL SOCIETY their cordial congratulations upon the completion of so long a period of useful work and their hope for the continuance of the successful and valuable work carried on by it.

The ENTOMOLOGICAL SOCIETY OF LONDON is the second of such societies to come into existence, and was founded only one year after the SOCIÉTÉ ENTOMOLOGIQUE DE FRANCE : it therefore ranks as nearly the oldest Entomological Society in the world. Although the study of insects may be considered to have begun with ARISTOTLE, little progress was made until the eighteenth century. Following upon the introduction of the binomial method of nomenclature by LINNAEUS, the development of the taxonomic study of insects, as of zoology generally, advanced rapidly ; among the investigators of this early period may be noted two of our countrymen, LEACH and WESTWOOD. The writings of DARWIN and WALLACE in the latter half of the nineteenth century gave renewed impetus, and the volume of investigations has increased to almost colossal dimensions.

Since the beginning of the present century a great change has come over the status of entomological science in the public eye. Previously regarded as a harmless but useless pastime, it is now realized to be of vital importance to the community because of the damage that the unchecked ravages of insect pests may do to health and to commodities.

The Council recall with pleasure the co-operation between the two Societies in the interesting experiment in progress during the past few years to introduce the Dutch Large Copper Butterfly in Woodwalton Fen, Huntingdonshire, in place of the English species which has become extinct, and they hope that such co-operation may long continue.

In confirmation and support of these presents this document is impressed with the Society's Seal and is signed this third day of May 1933.

ROTHSCHILD.
President.

G. F. HERBERT SMITH.
Secretary.

South London Entomological and Natural History Society.

To the
ENTOMOLOGICAL SOCIETY
OF LONDON

The Officers and Council
of the SOUTH LONDON
ENTOMOLOGICAL AND NATURAL
HISTORY SOCIETY
as representing the general body of
Members, offers to the
ENTOMOLOGICAL SOCIETY OF LONDON
their most sincere and hearty
congratulations on the occasion of the
Hundredth Anniversary

of the latter's foundation, and as one of the leading local Entomological Societies of England welcomes this opportunity of recognising the great services already rendered to Science by the ENTOMOLOGICAL SOCIETY OF LONDON and of tendering her their best wishes for the future.

Signed on behalf of the Society :

CHARLES de WORMS.
President.

T. R. EAGLES. THOS. H. L. GROSVENOR.
Vice-Presidents.

ALF. E. TONGE.
Hon. Treasurer.

STANLEY N. A. JACOBS. HY. J. TURNER.
Hon. Secretaries.

HY. J. TURNER.
Editor of Proceedings.

SIDNEY R. ASHBY.
Curator.

EDGAR E. SYMS.
Librarian.

K. G. BLAIR.
G. VERNON BULL.
ALFRED W. DENNIS.
C. N. HAWKINS.
M. NIBLETT.
F. STANLEY SMITH.
M. STANLEY SMITH.
S. WAKELY.
Members of Council.

May 3rd 1933.

Hibernia Chambers,
London Bridge, S.E. 1.

University of Aberdeen.

THE UNIVERSITY OF ABERDEEN

TO

THE ENTOMOLOGICAL SOCIETY OF LONDON

GREETING!

THE UNIVERSITY OF ABERDEEN sends Greetings to THE ENTOMOLOGICAL SOCIETY OF LONDON and joins with all interested in the progress of knowledge in adding its congratulations upon the Society's accomplishment of a century of service. Your Society has taken for its field the most numerous and most varied of all the classes of the animal creation, and in concentrating its energies upon so wide a field has taken a leading part in revealing the vital interest of the insect world to humanity in general and to man the interpreter of life.

During the hundred years of your Society's existence a vast change has taken place in the outlook towards insect life, partly because of the realisation of the economic significance of Insects first as crop destroyers (the damage done to crops in the United States of America alone is reckoned at £453,000,000 annually), and secondly as the prime causes or the carriers of diseases to man and his domestic animals, and partly because Insects have given a clue to some of the most startling developments of the science of genetics, the founder of which, GREGOR MENDEL, was a lad of eleven when your Society began.

In the encouragement of these interests, vital to the progress of Science and the welfare of Humanity, your Society has been pre-eminent, and the UNIVERSITY OF ABERDEEN wishes it increasing success and prosperity in the years that lie ahead.

GEORGE ADAM SMITH.
Principal and Vice-Chancellor.

H. J. BUTCHART.
Secretary of the University.

7th April 1933.

University of Cambridge.

UNIVERSITAS CANTABRIGIENSIS

SOCIETATI ENTOMOLOGICAE LONDINIENSI

SALUTEM

IPSE ILLE STYLOPS VESTER, quo pro sigillo soletis uti, cognomine suo artam cum Academia nostra significat consuetudinem. Kirbius enim qui primus parasitum illum apium vesparumque pestem detexit, cuius in honorem etiam nominatus est, Cantabrigiensis erat. Libenter etiam commemoramus quot quantique in scientia vestra fuerint alumni nostri, ex quo primus I. G. Children e Collegio Sancti Iohannis societatem vestram fundavit. Quanto scientiae incremento centum iam per annos WOLLASTON, DUNNING, GODMAN, immo et DARWIN

ille maximus, ceterique socii vestri laboraverint, quis computabit? Constat inter vos plurimos etiam fuisse illos qui mero entomologiae amore instincti studiis minutissimis se dederint; immo etiam societatis semper fuisse decus et tutamen. Ubi enim talis inveniri potest sociorum septingentorum societas? Quin etiam si parasitos investigare voltis, nihil parasiticum in se habet societas quae domo sua fruatur librisque suis, et quidquid litteris dederit per orbem terrarum semper acceptum esse cognoscat.

Ergo cum ferias saeculares vestras nobis nuntietis, et rogetis ut mittamus qui intersint, delegamus nostros IOHANNEM STANLEY GARDINER et AUGUSTUM DANIELEM IMMS qui vobis nostro nomine eandem posthac gloriam precentur quae semper per saeculum labores vestros consecuta est.

Datum Cantabrigiae
die xxix mensis Aprilis
mcmxxxiii.

University of Edinburgh.

In the name of the UNIVERSITY OF EDINBURGH, we desire to tender our cordial greetings to the ENTOMOLOGICAL SOCIETY OF LONDON on the occasion of the celebration of the Centenary of its foundation.

When the ENTOMOLOGICAL SOCIETY OF LONDON was founded, its work was chiefly of interest to those who were drawn to this branch of Biological Science by the intrinsic interest of the subject itself. It is now, however, universally recognised that insects play a vital part in regard to the maintenance of the health of man and of his domestic animals and also in regard to the maintenance and development of the output of the labour of man in the realms of Agriculture and Forestry.

As a result of this enlargement of the sphere of entomological science, the last quarter of a century has seen the establishment in many countries of Institutes of Research devoted entirely to Entomology, giving special attention to the medical and economic aspects of the science. Simultaneously there have been great developments in the teaching of this subject in all the important Universities of the world.

The UNIVERSITY OF EDINBURGH gladly recognises that the ENTOMOLOGICAL SOCIETY OF LONDON has done much to encourage and promote this development, both by the many valuable papers which have been published in its Transactions and by the encouragement it has always given to field work carried out in all parts of the world.

The University recalls with pleasure that it conferred the Honorary Degree of LL.D. in April 1900 upon Miss ELEANOR ORMEROD, one of the pioneers in the field of Economic Entomology, and the first British woman to receive that honour from the University of Edinburgh.

THOMAS N. HOLLAND. *Principal.*
T. HUDSON BEARE. *Dean of the Faculty of Science.*
W. A. FLEMING. *Secretary to the University.*

May 1933.

University of Glasgow.

THE UNIVERSITY OF GLASGOW
To the
ENTOMOLOGICAL SOCIETY
OF LONDON

THE UNIVERSITY OF GLASGOW offers to the ENTOMOLOGICAL SOCIETY OF LONDON its felicitations on the completion of a singularly fruitful first century, together with an assurance of its confident anticipation of a future no less fruitful and no less distinguished.

INSCRIBED in the Society's roll of members are the names of DARWIN, GALTON, BATES, WALLACE, who played an outstanding part in laying the foundations of modern biological philosophy, while the list of its PRESIDENTS and other OFFICE-BEARERS displays a long succession of world-famous leaders in the progress of entomological science.

IN the earlier volumes of its published records are to be seen the first foreshadowings of modern developments which have proved to be of great practical moment to mankind. The long series of subsequent volumes embodies in its distinguished pages impressive testimony to the general progress of the science of entomology.

THE ENTOMOLOGICAL SOCIETY OF LONDON has throughout the century of its existence functioned as a great living centre. Aided by its unique library and its generous co-operative spirit it has rendered services which merit well the world-wide recognition accorded on the present auspicious occasion.

ROBERT S. RAIT.
Principal and Vice-Chancellor.
J. R. CURRIE.
Clerk of Senate.

Glasgow, April 1933.

University of Oxford.

Cancellarius, Magistri et Scholares Vniversitatis Oxoniensis
Societatis Entomologicae Praesidenti et Sodalibus
S. P. D.

SALVETE, Entomologi doctissimi, saeculares iam celebraturi. Labores vestros admiramur, quibus per centum annos formicas, apes, vespas, cicadas, araneas, tineas, papiliones, aliasque huiusmodi bestiolas investigastis, in classes distribuistis, voluminibus iam plus quam octoginta descripsistis. Notus est vobis Vergilianus ille ' asper crabro ', necnon ' lucifugae ' quas nominat ' blattae '. Vos nimirum Lucretiano more vestigia emensi estis ' corpore quae in nostro culices et cetera ponunt '; vos, sicut Aristophanicus ille Socrates, demonstrare scitis ' pulex suos quot saliat ipsius pedes '. Propriis etiam nos vobiscum vinculis coniungunt viri insignissimi, FRIDERICUS HOPE et IOHANNES WESTWOOD, vestrae

sodalitatis inter fundatores. Illius benevolentia instituta est cathedra apud nos Zoologiae dicata, quam primus hic tenuit, deinde vir haud minus praeclarus, EDWARDUS BAGNALL POULTON, qui vobis hodie praesidet. Quare salutamus vos et fausta vobis omnia optamus. Testem benevolentiae nostrae ad vos mittimus virum illustrem, GALFRIDUM HALE CARPENTER, Doctorem in Medicina, qui has litteras vobis remittat et salutationes nostras adferat.

Datum in Domo Convocationis nostrae
a. d. vi Non. Maias MCMXXXIII.

University of St. Andrews.

Address
by the
UNIVERSITY OF ST. ANDREWS
to
THE ENTOMOLOGICAL SOCIETY
OF LONDON

On the memorable occasion of your Centenary Celebrations we send cordial greetings and congratulations.

A retrospect of the past hundred years of Biology shows how entomological enquiry, once the pastime or pursuit of a comparatively few, has come to engage the efforts of a great many, among whom are outstanding all those who seek to disclose the fundamental principles of heredity and organic evolution, and those who are militant in the unceasing warfare against the insect pests and insect vectors of disease that menace human welfare. In these services to science and mankind your Society and its members have borne, and are bearing, a most honourable part, the chronicle of which must give you justifiable pride and satisfaction.

A prospect of still greater service lies before you, and that success and prosperity attend your efforts is our sincere good wish.

J. C. IRVINE.
Vice-Chancellor and Principal.

The University,
St. Andrews, April 1933.

University of Sheffield.

The Council and Senate of the UNIVERSITY OF SHEFFIELD desire cordially to congratulate the ENTOMOLOGICAL SOCIETY OF LONDON on the completion of the first Hundred Years of its existence. During that century Entomology, which used to be regarded as the amusement of rather eccentric persons, has taken its proper and important place in the field of Science; and, while the work of the old collectors can never be remembered without gratitude and admiration, the new developments of Entomology in relation to health and industry, as well as its contributions to Biological Theory, have brought it to the front rank among the

Sciences which claim the recognition of all serious persons. In this development the ENTOMOLOGICAL SOCIETY OF LONDON has played a great part as a centre of information and of research, and as the scene of the continual discussion of important problems. The University wishes the Society a long career of prosperity and usefulness.

A. W. PICKARD-CAMBRIDGE.
Vice-Chancellor.

M. GIBBONS.
Registrar.

Sheffield.
May 1933.

Yorkshire Naturalists' Union.

TO THE PRESIDENT AND COUNCIL OF
THE ENTOMOLOGICAL SOCIETY
OF LONDON.

The Executive of the YORKSHIRE NATURALISTS' UNION desires to offer its congratulations to the ENTOMOLOGICAL SOCIETY OF LONDON on the attainment of the Hundredth Anniversary of its foundation. It also wishes to express its great appreciation for the valuable work which has marked the progress of the Society hitherto, and to express the hope that the high esteem in which the Society is held among the Scientific Institutions of the country may be maintained for a long series of years to come.

J. M. BROWN. *President.*
F. A. MASON. *Hon. Secretary.*

29, *Frankland Terrace,*
Leeds, 7.
1 *May* 1933.

Zoological Museum of Tring, Herts.

THE ZOOLOGICAL MUSEUM OF
TRING, HERTS,
offers its Congratulations to
the
ENTOMOLOGICAL SOCIETY
OF LONDON
on the occasion of its
Centenary
on the
Third of May, 1933.

KARL JORDAN. ROTHSCHILD.

Zoological Society of London.

To

THE ENTOMOLOGICAL SOCIETY OF LONDON

on the occasion of its Centenary

1833 1933

The President and Council of the

ZOOLOGICAL SOCIETY OF LONDON

in the name of the Society, send Congratulations and Greetings.

We recognise with admiration and gratitude the great contribution to knowledge of Insects made by the ENTOMOLOGICAL SOCIETY through its encouragement of research, its publications and its Library. The branch of the Animal Kingdom which is its special concern is unique in the multitude of its numbers and the variety of its forms, affords surpassing material for the scientific study of life, and has an intimate relation with the prosperity of human beings. The ENTOMOLOGICAL SOCIETY has devoted attention with equal success to systematic description, to evidence bearing on the modes of evolution, and to the economic aspects of its subject. We offer it our thanks for the past and our sure hopes for the future and we trust that the friendly relations, now a century old, between it and ourselves will continue.

We send this message of goodwill by the hands of our Secretary SIR PETER CHALMERS MITCHELL, Commander of the Order of the British Empire, Doctor of Laws and of Science, Fellow of the Royal Society of London.

Signed for the Council and Fellows

BEDFORD.
President.

P. CHALMERS MITCHELL.
Secretary.

April 1933.

ALGERIA.

Institut Pasteur d'Algérie.

ADRESSE

PRESENTÉE PAR L'INSTITUT PASTEUR D'ALGÉRIE

A LA SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES

A L'OCCASION DE SON CENTENAIRE.

L'INSTITUT PASTEUR D'ALGÉRIE adresse à la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES ses vives félicitations et ses vœux les meilleurs pour l'heureuse commémoration du Centenaire de sa fondation. Les laboratoires de microbiologie des pays chauds sont particulièrement redevables à la science entomologique. Dans le siécle qui vient de s'écouler, on a découvert que ce n'est pas le climat ni le sauvage qui empêchent la civilisation de s'implanter et de fleurir dans les pays tropicaux, mais que ce qui arrête le pionnier européen, ce sont les

maladies, dont les plus répandues et les plus meurtrières sont propagées par des insectes, en prenant ce mot dans son sens élargi. C'est pourquoi les laboratoires de microbiologie n'ont pu réaliser leurs découvertes sur l'étiologie et la prophylaxie des maladies que grâce aux riches documents et aux collections accumulés par les entomologues.

L'INSTITUT PASTEUR D'ALGÉRIE, en témoignant spécialement sa reconnaissance à la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES, lui adresse ses souhaits pour la continuation de sa prospérité et de son fécond travail scientifique.

Le Directeur
de l'Institut Pasteur
d'Algérie.
EDMOND SERGENT.

Alger, le 16 *février* 1933.

AUSTRIA.

Österreichische Entomologen-Verein Wien.

An die ENTOMOLOGICAL SOCIETY OF LONDON.

Der ÖSTERREICHISCHE ENTOMOLOGEN-VEREIN beehrt sich der ENTOMOLOGICAL SOCIETY OF LONDON zu ihrem hundertjährigen Bestande die herzlichsten Glückwünsche zu ubersenden.

J. NITSCHE.
Präsident.

Wien, den 27. *Februar* 1933.

Naturhistorisches Museum, Wien.

An die ENTOMOLOGICAL SOCIETY OF LONDON.

Das Jubiläum des hundertjährigen Bestandes der ENTOMOLOGICAL SOCIETY OF LONDON ist ein Ereignis, das auf der ganzen Erde bei allen Forschern, welche der Entomologie ergeben sind, die lebhafteste Anteilnahme erwecken muss. Im Verlaufe dieser hundert Jahre wurde von den englischen Entomologen auf den Gebieten der Anatomie und Systematik der Insekten wahrhaft bahnbrechende Arbeit geleistet. Noch grosszügiger und bedeutsamer aber war die Tätigkeit der englischen Entomologen auf dem Gebiete der faunistischen Erforschung der Erde. Unsere Kenntnis der Insektenfauna der landfernen Inseln beruhen zum grössten Teil auf den Ergebnissen englischer Forscherarbeit, und Männer wie WALLACE, BATES, WOLLASTON, PERKINS, SCOTT und andere haben durch ihre meisterhaften faunistischen Forschungen das unentbehrliche Fundament für jede zoogeographische Arbeit geschaffen. In aufrichtiger Bewunderung dieser unübertroffenen wissenschaftlichen Leistungen möge es mir gestattet sein, der ENTOMOLOGICAL SOCIETY OF LONDON im Namen des NATURHISTORISCHEN MUSEUMS

IN WIEN hiemit die herzlichsten Glückwünsche auszusprechen und ihr auch für die Zukunft das beste Gedeihen zu wünschen.

K. HOLDHAUS.

Wien, I. Burgring 7. am 22. April 1933.

Zoologisch-Botanische Gesellschaft in Wien.

DIE ZOOLOGISCH-BOTANISCHE GESELLSCHAFT IN WIEN
Beehrt sich der
ENTOMOLOGICAL SOCIETY
OF LONDON
Anlässlich Ihrer Hundertjahrfeier Ihre
Herzlichsten Glückwünsche
Zum Ausdruck zu bringen.
Im Gefühle der grössten Dankbarkeit gedenkt sie der
Bahnbrechenden wissenschaftlichen Arbeit, welche die
ENTOMOLOGICAL SOCIETY OF LONDON
Geleistet hat.

Die GESELLSCHAFT ist davon überzeugt, dass die ENTOMOLOGICAL SOCIETY OF LONDON auch in Hinkunft eine der führenden Körperschaften auf dem Gebiete der Entomologie bleiben wird und wünscht Ihrer Gesellschaft eine weitere glückliche Entwicklung.

Wien, im April 1933.

Die Präsidenten:

OTHENIO ABEL. F.M.Z.S., F.M.G.S. JAN VERSLUYS. C.M.Z.S. KARL RONNIGER.

BELGIUM.

Académie Royale de Belgique.

La Classe des Sciences de L'ACADÉMIE ROYALE DE BELGIQUE est heureuse de féliciter la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES à l'occasion du centenaire de la fondation de cette savante Compagnie.

Elle a toujours élu, au nombre de ses membres, des entomologistes, témoignant ainsi de l'estime en laquelle elle tient une discipline scientifique qui a tant contribué à étendre nos connaissances générales.

La série ininterrompue des publications de la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES atteste la féconde activité de celle-ci dans tous les domaines de l'Histoire naturelle des Insectes. On y trouve le reflet de cette profonde admiration de la Nature qui caractérise la race anglo-saxonne.

Les " Transactions " ont apporté une ample documentation à la Science. Tous ceux qui s'intéressent à la connaissance des êtres vivants peuvent s'unir, en un même sentiment de gratitude envers les entomologistes de l'Empire britannique.

Palais des Académies,
Bruxelles.

Musée Royal d'Histoire Naturelle, Bruxelles.

To the President of the

ENTOMOLOGICAL SOCIETY OF LONDON.

Dear Sir,

It is with great pleasure that the "MUSÉE ROYAL D'HISTOIRE NATURELLE DE BELGIQUE" takes part in the celebration of this important scientific event.

The ENTOMOLOGICAL SOCIETY OF LONDON, of which we are commemorating the centenary, has by the activity of its members always shown itself in the forefront of the scientific movement of the world. It is moreover the oldest but one of all societies devoted to this branch of Science.

When we glance back at the enormous amount of first class literature accumulated in your publications during the past century, we may look forward with confidence to your future, and we offer you our most heartfelt congratulations.

The Director of the Museum
V. Van STRAELEN.

The Deputy Keeper of Entomology:
ANTOINE BALL.

The Keeper of Entomology:
D'ORCHYMONT.

Cabinet du Directeur.
Brussels, 3rd May 1933.

Société Entomologique de Belgique.

Monsieur le Président,

LA SOCIÉTÉ ENTOMOLOGIQUE DE BELGIQUE est heureuse de pouvoir s'associer tout particulièrement aux fêtes jubilaires de sa sœur ainée L'ENTOMOLOGICAL SOCIETY OF LONDON. L'association dont vous célébrez aujourd'hui le Centenaire de la fondation a joué dans l'Histoire de l'Entomologie un rôle prestigieux attesté par les noms illustres qu'elle a comptés dans son sein et par l'inestimable production scientifique accumulée dans ses publications au cours d'un siècle de labeur persévérant.

LA SOCIÉTÉ ENTOMOLOGIQUE DE BELGIQUE vous adresse ses félicitations les plus chaleureuses et forme des vœux pour qu'à ce brillant passé succède un avenir tout aussi glorieux.

Bruxelles, le 3 mai 1933.
Pr Le Président en mission,

Le Vice-Président,
L. BURGEON.

Le Secrétaire,
A. CRÈVECŒUR.

31, *rue Vautier*
Bruxelles.

Société Royale Zoologique de Belgique.

SOCIÉTÉ ROYALE ZOOLOGIQUE
DE BELGIQUE

To the President and Members
of the ENTOMOLOGICAL SOCIETY
OF LONDON.

LA SOCIÉTÉ ROYALE ZOOLOGIQUE DE BELGIQUE est heureuse de se faire représenter par son Président en exercice aux fêtes du Centenaire de l'" ENTOMOLOGICAL SOCIETY OF LONDON," dont elle connait et apprécie hautement l'activité scientifique. Note Société félicite chaleureusement la vôtre pour le grand labeur qu'elle a accompli depuis un siècle et souhaite de tout cœur que votre Jubilé soit une brillante consécration d'un passé glorieux, gage certain d'un avenir fécond. Bien que notre Société ne s'occupe pas spécialement d'Entomologie, elle apprécie pourtant à sa juste valeur les travaux qui se font dans ce domaine et sait combien vos contributions y furent importantes. Veuillez donc agréer nos félicitations les plus cordiales et nos vœux les plus sincères pour la réussite de vos fêtes jubilaires.

Le Secrétaire, *Le Président,*
M. de SELYS LONGCHAMPS. PAUL BRIEN.

Bruxelles, le 27 *avril* 1933.

Union des Entomologistes belges.

A Messieurs les Président et Membres
de THE ENTOMOLOGICAL SOCIETY OF LONDON

Messieurs,

L'UNION DES ENTOMOLOGISTES BELGES et la direction de sa Revue mensuelle " Lambillionea " s'associent de tout coeur aux fêtes qui marquent cette année le Centenaire de la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES.

Nous connaissons et nous apprécions hautement l'importance des travaux, les précieux concours, que votre Compagnie a apportés depuis sa fondation, les poursuivant avec autorité et compétence, au développement des Sciences entomologiques.

Nous formons les meilleurs voeux pour voir le SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES persévérer dans la voie qu'elle n'a cessé de suivre depuis cent ans.

Nous avons l'honneur, Messieurs, de vous prier de recevoir avec l'expression de nos voeux les plus sincères, les nouvelles assurances de notre haute considération.

UNION DES ENTOMOLOGISTES BELGES et Revue mensuelle " Lambillionea."

Le Directeur,
F. DERENNE.

Bruxelles, le 29 *avril* 1933.

BULGARIA.

Royal Bulgarian Institute of Natural Science and the Bulgarian Entomological Society.

Mr. President,

The Royal Bulgarian Institute of Natural Science and the Bulgarian Entomological Society which I have the honour to represent on this great occasion, have instructed me to convey to you and to the Council and Members of the ENTOMOLOGICAL SOCIETY OF LONDON their congratulations on the illustrious past and their warm good wishes for the future of the Society. They desire me, Sir, to thank you for your kind invitation to join you in commemorating your centenary; and they express the confident hope that in spite of all the difficulties of the age you will continue to lead in the advancement and the diffusion of Entomological Science, and to set the same high example of achievement and endeavour which has been your glory for a hundred years.

I remain, Mr. President,
With every good wish
Yours most sincerely

PHILIP P. GRAVES, *Delegate.*

For the Bulgarian Entomological Society and the Royal Natural Science Institute of Bulgaria.

May 3 1933.

CANADA.

Entomological Branch of the Dominion of Canada Department of Agriculture.

1833–1933.

On the occasion
of the CENTENARY of the
ENTOMOLOGICAL SOCIETY OF LONDON,

THE ENTOMOLOGICAL BRANCH OF THE DOMINION OF CANADA DEPARTMENT OF AGRICULTURE, joins with other organizations in offering cordial and sincere greetings to its President, Council and members.

The science of entomology has developed rapidly during recent years, and in this progress the Entomological Society of London has taken a very prominent part. Through its publications it has greatly enriched the literature, and by means of its regular sessions it has brought together entomologists resident in various parts of the Empire.

THE ENTOMOLOGICAL BRANCH OF THE DOMINION OF CANADA DEPARTMENT OF AGRICULTURE considers it an honour to be invited to take part in these proceedings.

On behalf of the Branch,
ARTHUR GIBSON
Dominion Entomologist.

Ottawa, Canada.
April 10 1933.

CZECHOSLOVAKIA.

Czechoslovak Entomological Society of Prague.

SOCIETAS ENTOMOLOGICA ČECHOSLOVENICA
Praha II., Karlov, 3.

THE ENTOMOLOGICAL
SOCIETY
OF LONDON, 41, Queen's Gate,
London S.W.7.

Gentlemen,

THE CZECHOSLOVAK ENTOMOLOGICAL SOCIETY OF PRAGUE begs to express to you its congratulations on the hundredth anniversary of the foundation of your Society.

At the same time we would wish you all success in the future,

and beg to remain, Gentlemen,
Yours faithfully

ANT. VIMMER,
President.

J. KOMÁREK,
Vice President.

DR. LEO HEYROVSKÝ.
Secretary.

Prague, April 27
1933.

DENMARK.

Entomologisk Forening i København.

1833
1933

The President and Council
of
ENTOMOLOGISK FORENING I KØBENHAVN
cordially felicitates
THE ENTOMOLOGICAL SOCIETY OF LONDON

on the occasion of
the commemoration of
One Hundred Years
since its founding and the
completion of a Century of
distinguished service.

MATH. THOMSEN.
President.

AUGUST WEST. S. HORNÜNG. KAI L. HENRIKSEN. S. L. TUXEN.

EGYPT.

Egyptian Ministry of Agriculture.

Congratulation
From the EGYPTIAN MINISTRY OF AGRICULTURE
to the ENTOMOLOGICAL SOCIETY OF LONDON
on the
Centenary
May 1933

The MINISTRY OF AGRICULTURE OF EGYPT begs the ENTOMOLOGICAL SOCIETY OF LONDON to accept the most sincere congratulations on the completion of a glorious hundred years of active existence and continual progress.

The ENTOMOLOGICAL SOCIETY OF LONDON is renowned throughout the world for the exalted aims and ideals for which it stands. While it has fostered all branches of Entomology, the Society has always promoted the study of the subject for its own sake. The high standard of the works published in the *Transactions* of the Society makes it unique in the entomological world.

The MINISTRY OF AGRICULTURE OF EGYPT appreciates the fact that the fellowship of the Society is open to workers belonging to all nations, thereby making the Society more than purely national in its influence and scope. While the number of the Egyptian Fellows of the Society is, at present, small, the MINISTRY OF AGRICULTURE OF EGYPT looks forward in the near future to the Society accepting a larger number as may be qualified for that honour.

The MINISTRY OF AGRICULTURE OF EGYPT is confident that the active career of the ENTOMOLOGICAL SOCIETY OF LONDON will be continued for many centuries to come.

Delegate
HAMID SELEEM SOLIMAN.

Royal Agricultural Society of Egypt.

THE ROYAL AGRICULTURAL
SOCIETY OF EGYPT
to
THE ENTOMOLOGICAL
SOCIETY OF LONDON.

The representatives of the ROYAL AGRICULTURAL SOCIETY OF EGYPT have the honour to present their sincere greetings and congratulations to the ENTOMOLOGICAL SOCIETY OF LONDON on the occasion of its Centenary celebrated to-day.

The ROYAL AGRICULTURAL SOCIETY OF EGYPT, which we have the honour to represent, greatly appreciates the beneficial influence which the ENTO-

MOLOGICAL SOCIETY OF LONDON has exercised on science in general and on Entomological researches in particular. Its achievements within the last hundred years are conclusive evidence of its untiring efforts and of its endeavours to spread this science and bring it within the reach of every one interested in this or other scientific researches.

If we have come from afar to join you in the celebration of this centenary, it is because we know that by so doing we immortalize the achievements of those great scholars who have collaborated with the spread of science within the last hundred years.

The ROYAL AGRICULTURAL SOCIETY OF EGYPT which, since its establishment in 1898, has played and is still playing a great role in the development of Egyptian agriculture in all its branches, is also playing a considerable part in the study of Egyptian insects which are injurious to the various crops. The researches of the ENTOMOLOGICAL SOCIETY OF LONDON have been of an inestimable value in its work in this branch of Agriculture.

The ROYAL AGRICULTURAL SOCIETY OF EGYPT is under the aegis of our August Sovereign, King Fouad, who has graciously extended his patronage to many other scientific institutions in Egypt. It renders valuable services to our beloved Egypt, thanks to His Majesty's patronage and encouragement.

It is on behalf of the ROYAL AGRICULTURAL SOCIETY IN EGYPT, and in the name of its president H.H. Prince Omar Toussoun that we tender our sincerest congratulations to the ENTOMOLOGICAL SOCIETY OF LONDON. The scientific world which is greatly indebted to the latter for its valuable researches prays God that many more centenaries may be celebrated by it in future.

The Delegates
of the Royal Agricultural
Society of Egypt.
SAID BAHGAT. FRANK C. WILLCOCKS.

The President
of the Royal Agricultural
Society of Egypt.
OMAR TOUSSOUN.

May the 3rd 1933.

Société Royale Entomologique d'Egypte.

À La SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES,

Monsieur le Président,
chers Collègues,

En prenant la parole devant cette brillante Assemblée, réunie pour commémorer le Centenaire de la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES, mon souvenir se reporte à la cérémonie de l'an passé, qui nous avait groupés à Paris pour célébrer les cent ans d'existence et d'activité de la SOCIÉTÉ ENTOMOLOGIQUE DE FRANCE.

Cette succession de Centenaires ramène notre pensée à l'époque glorieuse durant laquelle, l'un après l'autre, les grands pays d'Europe reconnaissaient enfin l'immense portée pratique des études entomologiques.

Sous la conduite des grands pionniers de la méthode naturaliste, la curiosité du chercheur avait enfin renoncé aux pratiques, trop souvent fantaisistes, héritées des siècles précédents, et adoptait résolument les méthodes vraiment scientifiques

d'examen, de dissection et de classement, méthodes grâce auxquelles l'exploration de ce monde, encore mal connu, qu'est le groupe des innombrables animaux articulés, fait chaque jour de notables progrès.

Nous ne pouvons que difficilement nous imaginer aujourd'hui quelles durent être les jouissances intellectuelles éprouvées par ces précurseurs; il ne nous est pas facile non plus d'estimer à leur juste valeur les immenses difficultés qu'ils eurent à surmonter.

La célébration de ces Centenaires nous montre aussi combien rapidement le temps a passé.

En dépit des bouleversements politiques et sociaux, des évolutions des coutumes et du sens artistique, les hommes qui prenaient part aux premiers travaux de votre Société naissante sont encore étrangement bien près de nous. Leurs noms nous accompagnent dans toutes nos collections, associés aux déterminations génériques et spécifiques. Plus favorisés que les adeptes de plusieurs autres sciences, c'est encore avec profit et intérêt que nous relisons certaines descriptions, qui n'ont rien perdu de leur exactitude, et consultons les merveilleuses planches des artistes d'autrefois.

Mais que de progrès accomplis à côté de cette stabilité ! Le siècle écoulé a vu les systèmes de CUVIER et de LINNÉ céder le pas à ceux de DARWIN et de LAMARK, lesquels à leur tour ont été remplacés par les conceptions de De VRIES et de MENDEL. Chaque jour l'expérimentation vient, davantage, à l'aide du chercheur en lui permettant de suivre la transmission de caractères et les modifications des formes dans les générations successives.

Nous savons tous l'importante contribution apportée à ce progrès par la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES. Les noms illustres de DARWIN, de WALLACE et de tant d'autres sont présents à toutes les mémoires et leur esprit plane autour de nous.

L'étude des insectes devait s'avérer particulièrement intéressante pour l'Egypte, au double point de vue théorique et pratique.

Au point de vue théorique, parce que ce pays, situé aux limites de la région paléarctique et aux confins du désert, est resté inexploré pendant de longues années et renferme encore aujourd'hui une multitude de formes biologiques dont l'étude permettra de résoudre bien des questions mal connues : rapports philogénétiques, phénomènes d'adaptation écologique, migrations individuelles ou massives.

Au point de vue pratique, la place prépondérante qu'occupe l'Agriculture en Egypte y donne une importance toute spéciale aux insectes nuisibles, depuis les redoutables ennemis du coton, jusqu'au criquet pélerin (*Schistocerca gregaria* Forskal).

Et voilà pourquoi quelques chercheurs, animés de l'esprit des grands maîtres du passé, fondèrent au Caire la SOCIÉTÉ ROYALE ENTOMOLOGIQUE D'EGYPTE, bien modeste au début, mais qui s'est peu à peu épanouie en l'institution actuelle, vieille déjà de plus d'un quart de siècle.

Ce merveilleux développement, dont résulta l'organisme admirable que j'ai l'honneur de représenter aujourd'hui, se serait difficilement réalisé sans la bienfaisante intervention et sans la constante sollicitude de Sa Majesté le Roi FOUAD I^{er}, auquel l'Egypte doit sa merveilleuse renaissance dans tous les domaines de l'activité nationale.

Qu'il me soit maintenant permis de présenter, au nom de la SOCIÉTÉ ROYALE ENTOMOLOGIQUE D'EGYPTE, nos plus chaleureuses félicitations à la vénérable SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES, à l'occasion de son glorieux Centenaire. J'y joindrai également les souhaits de prospérité les plus sincères de vos confrères d'Egypte et l'expression de leur profonde gratitude et admiration pour l'œuvre accomplie par ses éminents travailleurs.

C'est en suivant le chemin lumineux tracé par les Institutions aînées que les Institutions plus jeunes ou encore nouvelles se formeront aux procédés scientifiques dont une expérience séculaire a prouvé la valeur et le parfait rendement.

Le Délégué
de la Société Royale Entomologique d'Egypte,
AN. ALFIERI.

Londres, Mardi 3 *Mai* 1933.

FINLAND.

Entomological Society of Helsingfors.

TO
THE ENTOMOLOGICAL SOCIETY
OF LONDON

With proud Satisfaction the ENTOMOLOGICAL SOCIETY OF LONDON can celebrate the Centenary of its foundation, looking back at an exceedingly fruitful and important activity on the field of entomological research. Not only has this activity materially enriched British natural Science, but it has also to a great extent promoted international co-operation.

On this solemn occasion our young ENTOMOLOGICAL SOCIETY OF HELSINGFORS begs to convey to THE ENTOMOLOGICAL SOCIETY OF LONDON its most respectful good wishes and its expression of profound gratitude and reverence for what your celebrated Society has achieved during the century of its existence.

THE ENTOMOLOGICAL SOCIETY
OF HELSINGFORS

R. FORSIUS.
President.

RICHARD FREY.
Honorary Secretary.

FRANCE.

Institut de France, Académie des Sciences.

L'ACADÉMIE DES SCIENCES DE L'INSTITUT DE FRANCE adresse, à la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES, à l'occasion de son centenaire, ses plus chaleureuses félicitations pour l'œuvre admirable qu'elle a accomplie

depuis cent ans et pour tous les progrès importants qui ont été réalisés dans le domaine des sciences biologiques, grâce à son initiative ou à ses encouragements.

Elle adresse aussi à son Président et à ses membres, l'expression de sa vive sympathie et les prie d'accepter les vœux qu'elle forme pour que l'avenir de la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES s'affirme toujours de plus en plus brillant et de plus en plus prospère.

Le Président,
CHARLES RICHET.

Le Secrétaire perpétuel pour les sciences mathématiques,
E. M. PICARD.

Le Secrétaire perpétuel pour les sciences physiques,
A. LACROIX.

Institut national Agronomique.

Ministère de l'Agriculture.
Institut National Agronomique
16, Rue Claude-Bernard, 16
Paris V^e^.

L'INSTITUT NATIONAL AGRONOMIQUE et plus spécialement le laboratoire de Zoologie sont particulièrement heureux d'exprimer à the ENTOMOLOGICAL SOCIETY OF LONDON, à l'occasion des cérémonies de son Centenaire, les sentiments d'admiration qu'ils éprouvent pour son glorieux passé et de lui transmettre les vœux chaleureux qu'ils forment pour sa prospérité dans l'avenir. Ils espèrent que les relations amicales qui ont toujours existé entre les membres de cette illustre Compagnie et leur personnel scientifique ne feront que s'accroître de jour en jour.

Le Directeur de l'Institut national agronomique,
L. ALQUIER.

Le Professeur de Zoologie,
P. MARCHAL.

Paris, Mai 1933.

Institut national d'Agronomie coloniale.

Ministère des Colonies.
Institut national
d'Agronomie coloniale.

L'INSTITUT NATIONAL D'AGRONOMIE COLONIALE est heureux de pouvoir adresser ses meilleurs vœux et ses sincères félicitations à la vénérable ENTOMOLOGICAL SOCIETY OF LONDON dont les travaux sur les insectes des régions tropicales et subtropicales sont si précieux pour les recherches sur les parasites des plantes coloniales.

Le Directeur de l'Institut national d'Agronomie coloniale,
EM. PREUDHOMME.

Le Professeur de Zoologie,
P. VAYSSIÈRE.

Nogent-sur-Marne, Mai 1933.
(*Seine*)

Institut Pasteur.

Centenaire de la SOCIÉTÉ ENTOMOLOGIQUE

DE LONDRES.

3–5 Mai 1933

L'INSTITUT PASTEUR a tenu à rendre un légitime hommage à la Science Entomologique britannique en se faisant représenter aux Cérémonies commémoratives du centenaire de la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES.

Parmi les Centres d'Etudes consacrés à l'Histoire des Insectes, la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES est un des plus anciennement constitués et des plus actifs du monde. Son influence s'est exercée dans tous les domaines de la Recherche entomologique. Elle compte parmi ces Membres nombre de Systématiciens éminents et de grands Biologistes.

Aujourd'hui où la Science entomologique, débordant largement le cadre des connaissances théoriques, a marqué son empreinte profonde en des branches diverses de l'activité humaine, l'importance de cette Science a su spécialement s'affirmer dans le domaine des maladies. Vers la fin du siècle dernier, dans le champ de la Médecine et de l'Hygiène une science nouvelle a pris corps : l'Entomologie Médicale.

La connaissance approfondie des Insectes susceptibles de transmettre à l'homme ou aux animaux des affections redoutables n'a pas tardé à se révéler indispensable, à la suite des recherches mémorables de SIR PATRICK MANSON et celle de SIR RONALD ROSS qui décelaient l'un et l'autre le rôle jusqu'alors insoupçonné des moustiques comme véhicules de parasites du sang.

Née de ces conceptions nouvelles, l'Entomologie médicale a peu à peu conquis une place de premier ordre dans l'histoire moderne des maladies. L'INSTITUT PASTEUR tient à souligner le magnifique effort accompli par les savants britanniques dans cette branche spéciale de Recherches.

Il adresse ses vœux les plus vifs à la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES, à l'occasion de son centenaire, en souhaitent de voir se resserrer de plus en plus dans l'avenir les liens qui rattachent cet important groupement de spécialistes des Insectes avec le centre pastorien d'Etudes Entomologiques.

DR. ROUX.

F. MESNIL. DR. A. CALMETTE.

E. ROUBAUD.

Lépidoptéristes de Paris.

Les LÉPIDOPTÉRISTES DE PARIS adressent à la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES à l'occasion de son centenaire leurs félicitations et leurs meilleurs vœux de prospérité.

E. L. BOUVIER.
H. MOREAU. H. STEMPFFER. M. DESLANDES.
ROGER ALLARD. MARQUIS de FLEURY. J. VARIN. L. Le CHARLES.
Vte HERVÉ du TOULGOËT.
ANDRE BAYARD. P. MERCY. J. MERCY.
A. LAVALLÉ. FAIVRE.
A. FOUQUINÉRE. G. PROVIEL. RENEE LICHY. A. MÈGRE.
E. RIVALIER. LEO FONTAN. LEON RADOT. L. LEGRAS.
C. HERBULOT. C. BAYARD-BLEUSE. H. UNGEMACH.
AIMÉE de HORRACK-FOURNIER.
GEORGES CATHARIN. G. C. MOREUX. L. SERAPHIN.
GEORGES ROUSSEAU DECELLE. PERCY I. LATHY.
F. Le CERF.

Paris
MCMXXXIII
mai

Muséum national d'Histoire naturelle.

LE MUSÉUM NATIONAL D'HISTOIRE NATURELLE et en particulier le Laboratoire d'Entomologie de cet Etablissement expriment à L'ENTOMOLOGICAL SOCIETY OF LONDON, à l'occasion de son Centenaire, leurs très vives félicitations et leurs vœux de prospérité les plus sincères.

Ils apprécient à sa haute valeur l'admirable série de ses publications, véritable monument élevé à la Science par les Entomologistes britanniques.

Et ils rendent hommage aux savants éminents qui ont dirigé ses travaux et perpétué le goût des recherches désintéressées dans les diverses branches de l'Entomologie.

Paris, le 27 *avril* 1933.

PAUL LEMOINE. *Pour le Professeur Jeannel en*
P. LESNE. *mission à l'etranger*
PROFESSEUR E. BOURDELLE.
F. Le CERF. LUCIEN BERLAND.
SÉGUY. L. CHOPARD.

Société de Biogéographie.

La jeune SOCIÉTÉ DE BIOGÉOGRAPHIE tient à s'associer à la célébration du Centenaire de

THE ENTOMOLOGICAL SOCIETY OF LONDON.

Elle est heureuse de souligner ainsi l'importance des études entomologiques dans les recherches si captivantes qui tiennent compte des facteurs extérieurs dans la répartition des êtres vivants.

Elle souhaite enfin à THE ENTOMOLOGICAL SOCIETY OF LONDON un avenir digne de son glorieux passé.

Paris, Mai 1933.
Le Secrétaire général,
P. VAYSSIÈRE.

Société entomologique de France.

1833 1933

To the
ENTOMOLOGICAL SOCIETY
OF
LONDON

Le Président et le Conseil de la SOCIÉTÉ ENTOMOLOGIQUE DE FRANCE représentant les membres de la Société, offrent à the ENTOMOLOGICAL SOCIETY OF LONDON leurs plus sincères et cordiales félicitations à l'occasion de son Centenaire.

Au lendemain des manifestations de sympathie qui lui ont été témoignées, la SOCIÉTÉ ENTOMOLOGIQUE DE FRANCE est heureuse d'exprimer à la grande Société entomologique britannique les sentiments d'admiration qu'elle éprouve pour son glorieux passé et de lui transmettre les vœux qu'elle forme pour sa prospérité dans l'avenir.

Le Président honoraire.
E. L. BOUVIER.

Les Secrétaires.
L. CHOPARD.
LUCIEN BERLAND.

Le Président.
H. BERTHET.

Paris, Mai 1933.

Société zoologique de France.

La SOCIÉTÉ ZOOLOGIQUE DE FRANCE est profondément heureuse d'apporter à la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES, a l'occasion de son centième anniversaire, l'hommage d'admiration que meritent son glorieux passé, sa féconde activité scientifique.

Elle tient a y ajouter l'expression de sentiments très amicaux et les souhaits sincères qu'elle forme pour sa prospérité dans l'avenir.

à Paris, le Ier Mai 1933.

Station entomologique de Paris.

Ministère de l'Agriculture
Institut des Recherches Agronomiques.

A Monsieur le Président
de la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES.

Au nom de la STATION ENTOMOLOGIQUE DE PARIS, je prie la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES d'accepter le témoignage de notre admiration

pour les magnifiques travaux qu'elle n'a cessé de produire depuis sa fondation et pour tous les progrès que lui doivent les Sciences biologiques.

A l'occasion de son centenaire, nous lui adressons de tout cœur nos plus chaudes félicitations et nos vœux les plus cordiaux pour l'avenir de sa glorieuse carrière.

P. MARCHAL.
Directeur de la Station Entomologique de Paris.

Paris, le 28 *Avril* 1933.

Vivarium du Muséum national d'Histoire naturelle.

Le Vivarium
du
MUSÉUM NATIONAL D'HISTOIRE NATURELLE
rattaché à la chaire d'Entomologie
est avant tout un Insectarium
A ce titre la direction du Vivarium est
heureuse de prendre part à la célébration du
Centenaire de
L'ENTOMOLOGICAL SOCIETY OF LONDON.
Elle lui adresse à cette occasion ses plus cordiales
félicitations et ses vœux de prospérité pour
l'avenir.

Pour le Directeur Professeur d'Entomologie.
Dr. R. Jeannel
Le Directeur-adjoint
L. CHOPARD.

Paris. Mai 1933.

GERMANY.

Deutsche Entomologische Gesellschaft.

An die
ENTOMOLOGICAL SOCIETY OF LONDON

Zur Feier des 100-jährigen Bestehens der ENTOMOLOGICAL SOCIETY OF LONDON entbietet die DEUTSCHE ENTOMOLOGISCHE GESELLSCHAFT der Jubilarin herzliche Grüsse und Glückwünsche ! Mit aufrichtiger Bewunderung gedenkt sie der hervorragenden Leistungen auf allen Gebieten der Entomologie, die aus dem Schosse der älteren Schwester im Verlaufe eines Jahrhunderts hervorgegangen sind und die ihren Niederschlag in einer stattlichen Reihe von Bänden der Transactions und der Proceedings gefunden haben. Mit besonderem Vergnügen und mit grosser Befriedigung gedenkt sie ferner der engen und freundschaftlichen Beziehungen, die seit Jahrzehnten zwischen der Jubilarin und der DEUTSCHEN

ENTOMOLOGISCHEN GESELLSCHAFT bestehen und deren Fortsetzung sie sich auf das lebhafteste angelegen sein lassen wird. Möge das zweite Jahrhundert der ENTOMOLOGICAL SOCIETY OF LONDON ebensoviel Ruhm, Ehre und Erfolg eintragen wie das jetzt beendete!

In Namen des Vorstandes:
DR. H. HEDICKE.
I. Vorsitzender.

Berlin N. 4, den 3. Mai 1933
Invalidenstr. 43

Entomologischer Verein zu Stettin.

An
DIE ENTOMOLOGICAL SOCIETY OF LONDON!

Mit der Jubilarin, die heute mit berechtigtem Stolz und Genugtuung auf hundert Jahre wissenschaftlicher Betätigung zurückblicken kann, verbinden uns langjährige und erfreuliche Beziehungen. Sie wurden eingeleitet in Januar 1845 durch die Ernennung J. O. WESTWOODS zum Ehrenmitglied unseres Vereins und durch einen Schriftenaustausch Wiederholte Besuche unseres—Präsidenten C. A. DOHRN in London brachten ihn den führenden Mitgliedern der Society persönlich nahe. Die Freundschaft mit diesen Männern, insbesondere mit H. T. STAINTON, die ein umfänglicher, in unserem Archiv bewahrter Schriftwechsel bezeugt, hat um die Mitte des vorigen Jahrhunderts, und darüber fortwirkend, nicht wenig zur gegenseitigen Befruchtung der englischen und deutschen Entomologie beigetragen.

Ein Jahrhundert glänzender Entwickelung der Naturwissenschaften liegt hinter uns, an der die ENTOMOLOGICAL SOCIETY OF LONDON rühmlichen Anteil hat. Möchte es ihr beschieden sein, im neuen Jahrhundert mit gleichem Erfolg zu wirken!

Der Vorstand.
W. MEYER.

Stettin, 28. *April* 1933.

Preussische Akademie der Wissenschaften.

Als vor 100 Jahren 9 Männer zur Gründung der LONDONER ENTOMOLOGISCHEN GESELLSCHAFT zusammentraten, da konnte wohl niemand ahnen, dass sich das Reis, das hier gepflanzt wurde, zu einem so gewaltigen Baum entwickeln würde. Es waren günstige Auspicien, unter denen die junge Gesellschaft zusammentrat. Die beiden Väter der Britischen Entomologie, WILLIAM KIRBY und WILLIAM SPENCE, als Ehrenmitglieder waren gleichsam ihre Schutzpatrone und Kennzeichneten am besten die Bestrebungen, von denen die Gründung ausgegangen war: Förderung und Ausbreitung der entomologischen Wissenschaft durch gemeinsame Arbeit, Gedankenaustausch und Ermunterung zu Beobachtung und Experiment. Diese Ziele entfalteten eine gewaltige Anziehungskraft. Die Zahl der Mitglieder stieg schnell; nach 50 Jahren waren es nahezu 300, jetzt sind es über 700. Sie sitzen nicht nur in Grossbritannien, sondern weit verbreitet, überall wo

die englische Sprache herrscht; um die Veteranen der Britischen Entomologie sammeln sich die jungen aufstrebenden Kräfte. In den Listen der Gesellschaft finden sich Namen von hohem Klang, wie CH. DARWIN, A. R. WALLACE, H. W. BATES, Sir J. LUBBOCK und J. O. WESTWOOD. Auch aus anderen Kulturländern schloss sich mancher dieser Forschungsgemeinschaft an, und die Deutschen Namen, denen wir da begegnen, haben auch in ihrer Heimat einen guten Klang. Ihre weitreichende Bedeutung hat die Gesellschaft auch darin betätigt, dass sie zu Ehrenmitgliedern auch hervorragende Entomologen ausserhalb Grossbritanniens ernannte, von deutschen H. BURMEISTER und C. T. E. VON SIEBOLD. Als sichtbare Frucht der hundertjährigen Arbeit liegen jetzt 80 Bände Transactions, 7 Bände Proceedings und der Anfang der erst im vorigen Jahre begründeten Zeitschrift Stylops vor. Wertvolle Arbeiten sind darin veröffentlicht, die "das verborgene Wissen weltfremder Forscher der Öffentlichkeit zuführen," und unendlich viel Anregung ist mit ihnen in die Welt hinausgegangen. Möge der ENTOMOLOGICAL SOCIETY OF LONDON auch weiterhin der gleiche Erfolg wie bisher beschieden sein bei ihrer segensreichen Mitarbeit an der Mehrung der Erkenntnis zum Besten der Menschheit. Das ist unser Wunsch zu ihrer Säkularfeier.

Die Preussische Akademie der Wissenschaften

M. PLANCK.

Berlin den 1. *Mai* 1933.
NW. 7. *Unter den Linden* 38.

Staatliche Museen für Tierkunde und Völkerkunde, Dresden.

An die ENTOMOLOGICAL SOCIETY,
LONDON.

Der ENTOMOLOGICAL SOCIETY OF LONDON beehre ich mich zur Feier ihres hundertjährigen Bestehens namens des von mir geleiteten Museums und gleichzeitig als ihr Mitglied meinen aufrichtigen Glückwunsch darzubringen. Die Gesellschaft hat in dem verflossenen Jahrhundert in der Förderung der wissenschaftlichen Insektenkunde soviel geleistet, dass es überflüssig ist, diese Verdienste in ihrem ganzen Umfang zu würdigen. Das grösste davon ist jedenfalls die Herausgabe der Transactions und Proceedings, die eine Fülle von Entdeckungen vor die Öffentlichkeit gebracht haben, so dass sie für jeden wissenschaftlich arbeitenden Entomologen eine unerschöpfliche Fundgrube bilden. Während die Gesellschaft durch ihre regelmässigen Sitzungen für die Belehrung und Weiterbildung ihrer hauptstädtischen Mitglieder sorgt, führt sie mit jenen Zeitschriften den Fachgenossen der ganzen Erde wissenschaftlichen Stoff und Anregung zu und fordert dadurch jeden einzelnen zur Dankbarkeit auf. Dieser Pflicht der Dankbarkeit selber zu genügen, ist mir Bedürfnis, ebenso dem Wunsch Ausdruck zu geben, dass der neu begonnene Lebensabschnitt unserer alten Körperschaft von demselben hohen Streben geleitet, von gleichen Erfolgen beglückt sein möge!

In aller Verehrung
A. JACOBI,
F.E.S.

Den 4. *Mai* 1933

Zoologisches Staatsinstitut und Zoologisches Museum in Hamburg.

Das Zoologische Staatsinstitut
und Zoologische Museum in Hamburg

nimmt innigen Anteil an der seltenen
Feier des hundertjährigen Bestehens der
ENTOMOLOGISCHEN GESELLSCHAFT
IN LONDON
und wünscht ihr auch in Zukunft
weitere erfolgreiche Tätigkeit im Dienste
der Wissenschaft

Im Namen der Anstalt
Direktor
H. LOHMANN, Prof. Dr.

Hamburg, den 3. *Mai* 1933.

HAWAII.

Hawaiian Entomological Society.

THE HAWAIIAN ENTOMOLOGICAL SOCIETY sends greetings to the ENTOMOLOGICAL SOCIETY OF LONDON on the occasion of the Centenary of its foundation and congratulates the Society, with whose aims it has so close a sympathy, on a century of valuable work and wishes it many more centuries of further prosperity for the advancement and benefit of Science. It is fitting to recall the fact that in its earlier years several most active members of the Hawaiian were at the same time Fellows of the LONDON ENTOMOLOGICAL SOCIETY; that a former President of the latter, DAVID SHARP, and his colleague T. BLACKBURN, both lately honorary members of the HAWAIIAN ENTOMOLOGICAL SOCIETY, may be considered the pioneers of Hawaiian entomology, while other of the Fellows have contributed largely to the elucidation of the Hawaiian Insect Fauna.

R. C. L. PERKINS.
Delegate
(*representing the President*).

Hawaiian Sugar Planters Association.

THE
HAWAIIAN SUGAR PLANTERS
ASSOCIATION
offers its sincere congratulations
to the
ENTOMOLOGICAL SOCIETY
OF LONDON

on the celebration of its Centenary and on the great work it has accomplished since its foundation.

The H.S.P.A. wishes the Society the same success in the future as it has achieved in the past, and it may be mentioned as a tie between them that several members of its own entomological staff were also Fellows of the Society.

R. C. L. PERKINS.
Delegate
(*for the Officers of the H.S.P.A.*).

IRELAND.

Royal Dublin Society.

To the President and Council
of the
ENTOMOLOGICAL SOCIETY OF LONDON.

We, the President and Council of the ROYAL DUBLIN SOCIETY, desire to offer to the ENTOMOLOGICAL SOCIETY OF LONDON our sincere felicitations on the occasion of the Centenary of its foundation.

The study of entomology in all its branches has attained increasing importance as research proceeds into many problems concerning human welfare and human activities, particularly the advancement of agriculture, in which the ROYAL DUBLIN SOCIETY is much interested.

It is, therefore, with deep sincerity that we wish to the ENTOMOLOGICAL SOCIETY a future as fruitful in work of scientific and economic importance as its past has been.

POWERSCOURT. *President.*
F. E. HACKETT. *Honorary Secretary.*

Royal Irish Academy.

TO THE PRESIDENT AND FELLOWS
OF THE
ENTOMOLOGICAL SOCIETY OF LONDON.

THE ROYAL IRISH ACADEMY cordially joins with the representatives of science and learning at home and abroad in congratulations to the ENTOMOLOGICAL SOCIETY OF LONDON on the completion of the first century of the Society's existence.

The Academy is united with the Society not merely by the sympathy of a common aim—the advance of scientific knowledge—but by virtue of the many personal links in those eminent scientists who have been members of both bodies.

Since its foundation the ENTOMOLOGICAL SOCIETY has issued an important series of Transactions and Proceedings, which now form the repository of much knowledge bearing upon the studies that it is the purpose of the Society to foster. The broader outlook and wider extension of entomological studies are reflected in the increasing variety of the memoirs published by the Society.

The Royal Irish Academy, represented to-day by R. F. SCHARFF, former Vice-President and Member of Council, confidently hopes that the success of the ENTOMOLOGICAL SOCIETY in the past century may be but the foreshadowing of greater progress in the future.

R. LLOYD PRAEGER.
President.

JOHN J. NOLAN.
Secretary.

Royal Zoological Society of Ireland.

TO THE PRESIDENT, COUNCIL, AND FELLOWS
OF THE
ENTOMOLOGICAL SOCIETY OF LONDON

THE ROYAL ZOOLOGICAL SOCIETY OF IRELAND, which celebrated its Centenary only two years ago, has pleasure in sending as delegate one of its former Secretaries, who is a Fellow of the ENTOMOLOGICAL SOCIETY OF LONDON, to offer most sincere and cordial congratulations on the Hundredth Anniversary of that Society's foundation, and on the vast amount of valuable research which has been carried out by its Fellows since 1833 in all branches of Entomology.

The very large number of species included within the Class Insecta renders it essential that special Societies should be established and maintained to study them. Yet numerous bionomic links between insects and other classes of animals have during the last hundred years been demonstrated and their importance recognised, notably in connection with those blood-sucking insects by whose means noxious microscopic parasites are regularly transmitted to vertebrate hosts, and also with other insects which, for part or the whole of their life-cycles, may be parasites in or on the bodies of wild vertebrates and inmates of Zoological Gardens throughout the world. The increasing recognition of the mutual interests of students of insects and of the "higher" animals renders it most fitting for a Society specially concerned with the maintenance of a collection of living beasts, to salute on this occasion a sister-Society whose members have, with so much perseverance and success, devoted their energies to the study of creatures, mostly minute in size, but multitudinous in number and often of the greatest economic and hygienic importance.

H. M. PATRICK.
President.

J. A. MATSON, M.D.
Honorary Secretary.

Royal Zoological Society of Ireland,
Phœnix Park, Dublin.

University of Dublin.

TO THE PRESIDENT, COUNCIL, AND FELLOWS
OF THE
ENTOMOLOGICAL SOCIETY OF LONDON

On behalf of the UNIVERSITY OF DUBLIN we offer cordial congratulations to the ENTOMOLOGICAL SOCIETY OF LONDON on the occasion of the Centenary of its foundation.

The University desires to express its appreciation of the important work which the Society has done and is doing for Science, and particularly of the valuable contributions which have been made by its Fellows to the application of the Darwinian Theories in the special field of Entomology.

The University's representative at the Centenary, Dr. J. BRONTË GATENBY, Professor of Zoology, has had the privilege of studying under a former President of the Society, Professor E. B. POULTON, F.R.S., whose distinguished work on mimicry and sexual selection among insects has added lustre to the Society's record. Dr. GATENBY is charged to convey the good wishes of the University for the Society's Centenary celebration, and for the continuance of its prosperity and the furtherance of its scientific labours.

E. J. GWYNN.
Provost of Trinity College, Dublin.

W. A. GOLIGHER.
Registrar of the University of Dublin.

University College, Dublin.

The President and Governing Body of UNIVERSITY COLLEGE, DUBLIN, present their compliments to the President, Vice-Presidents, Council and Officers of the ENTOMOLOGICAL SOCIETY OF LONDON and have appointed Mr. JOHN CARROLL, M.Sc., to be their official representative and the bearer of their sincere felicitations on the occasion of the One Hundredth Anniversary of the foundation of the Society.

The ENTOMOLOGICAL SOCIETY OF LONDON is one of the oldest entomological societies in existence. It includes on its roll the names of many of the most illustrious entomologists of the past century and the academic distinctions and achievements of the present members leave no doubt that the prestige of the Society will be maintained and enhanced.

The honoured position which Entomology holds in the world of Science to-day is largely due to the untiring efforts and devoted labours of those members of the ENTOMOLOGICAL SOCIETY OF LONDON whose special sphere has been the study of the morphology, metamorphoses and classification of insects. Apart altogether from its intrinsic value this fundamental work has made possible the development and rapid progress during recent years of that branch of the Science which has come to be known as Economic Entomology.

All those interested in the advancement of scientific knowledge will be unanimous

in wishing continued prosperity to a Society which has given such valuable service to Science and has earned for itself during the first hundred years of its existence a repute both honourable and outstanding.

Signed on behalf of the

Governing Body of University College, Dublin.

DENIS J. COFFEY *President,*
J. P. DREW. *Professor of Agriculture,*
JOHN W. BACON. *Secretary.*

3rd May 1933.

ITALY.

R. Laboratorio di Entomologia Agraria, Portici.

Il LABORATORIO DI ENTOMOLOGIA AGRARIA DI PORTICI si associa alla celebrazione del Centenario della SOCIETÀ ENTOMOLOGICA DI LONDRA con animo pieno di ammirazione e di riconoscenza, perchè l'opera dei Membri di tale Sodalizio, continuata ininterrotta per cento anni, rappresenta un grandissimo contributo per una migliore conoscenza degli Insetti e una fervida propaganda per lo studio di tali animali.

LA SOCIETÀ ENTOMOLOGICA DI LONDRA cogli ottanta volumi delle sue pubblicazioni, costituenti una miniera di utili cognizioni per tutti i rami dell'entomologia, si è conquistata un posto distintissimo tra le società scientifiche benemerite dell'Umanità e deve ricevere i più sinceri voti che la sua opera continui collo stesso fervore nei secoli futuri per la migliore conoscenza degli Insetti, che hanno una importanza grandissima per la scienza e per l'economia.

Portici, 3 *Maggio* 1933– *XI.*

Il Direttore.
FILIPPO SILVESTRI.

Società Entomologica Italiana.

LA SOCIETÀ ENTOMOLOGICA ITALIANA è lieta di esprimere alla SOCIETÀ ENTOMOLOGICA DI LONDRA, nell'occasione della celebrazione del suo centenario, le più sincere felicitazioni per la splendida opera compiuta, in un secolo di fattiva operosità, a vantaggio della scienza, e i voti ferventi di tutti gli Entomologi d'Italia perchè questa preziosa attività possa nell'avvenire sempre più svilupparsi e intensificarsi per il conseguimento degli alti scopi communi.

Il Presidente
FERDINANDO SOLARI.

Genova, 3 *Maggio* 1933.–*XI–EF.*

NEW ZEALAND.

The Cawthron Institute.

TO THE PRESIDENT AND COUNCIL OF THE ENTOMOLOGICAL SOCIETY.

The CAWTHRON INSTITUTE, one of the youngest Research Institutes in the Empire, desires to pay homage to the ENTOMOLOGICAL SOCIETY on the occasion of its Centenary. The members of your Society resident in New Zealand have by their earnest example stimulated many New Zealanders to take up the study of Entomology, and the Researches of your Fellows have contributed in no small measure to the welfare of the Agricultural Community in the Dominion of New Zealand, and to the reputation of this Institute. Your publications are to us a mine of intellectual wealth, and serve in no small degree to strengthen the feeling of oneness with the workers in the Empire. May your Society continue to grow in reputation and usefulness and in its influence upon Imperial culture.

W. J. MOFFATT. *Chairman of the Trust Board.*
THOMAS H. EASTERFIELD. *Director.*
DAVID MILLER. *Chief Entomologist.*

February 20 1933.

NORWAY.

Norsk Entomologisk Forening and Universitetets Zoologiske Museum, Oslo.

THE ENTOMOLOGICAL SOCIETY
OF LONDON
1833–1933

NORSK ENTOMOLOGISK FORENING
and
UNIVERSITETETS ZOOLOGISKE MUSEUM, OSLO

send their heartiest congratulations to your centenary.

We admire your great work in exploring the largest of all groups of animals in existence, and the most important for man's welfare.
We thank you for the rich results for the science and for mankind.

Oslo, April 1933.

T. MUNSTER.
Chairman of the Society.

ALF. WOLLEBAEK.
Director of the Museum.

RUSSIA.

Entomological Society of the Soviet Union.

The Centenary of the ENTOMOLOGICAL SOCIETY OF LONDON affords the ENTOMOLOGICAL SOCIETY OF THE SOVIET UNION a magnificent opportunity for expressing its permanent feelings of deepest respect and admiration for the scientific merits of its Senior Fellow Society.

The ENTOMOLOGICAL SOCIETY OF LONDON is not only the centre of entomological thought for the Anglo-Saxon world, its works, which have embraced every region of entomology, have become leading for the scientists of all countries and, in particular, for those of the Soviet Union. The ENTOMOLOGICAL SOCIETY OF LONDON has always based its activities on exact science and broad philosophical views and has accumulated in its publications a vast material for further speculation.

The ENTOMOLOGICAL SOCIETY OF THE SOVIET UNION is confident that, following its broad course, the ENTOMOLOGICAL SOCIETY OF LONDON will surely arrive at still greater results, and cordially wishes it prosperous progress.

President. E. N. PAVLOVSKY.
Honorary President. ANDREW SEMENOFF TIAN-SHANSKI.
Vice Presidents. A. DJAKONOV. N. J. KUSNEZOV.
Secretary. N. FILIPJEV.

Members of the Society.

V. KIESERITZKY.
S. MALYSHEV.
A. WULFF.
P. REZVOĬ.
W. RYLOV.
A. MORDVILKO.
V. STARK.
D. ZNOJKO.
D. OGLOBLIN.
A. STACKELBERG.
W. BEY BIENKO.
A. KIRITSCHENKO.
A. SERASIMOV.
V. REDIKORZEV.
V. POPOV.
B. ROBDOUDORF.
E. MIRAM.
A. SKOZIKOW.
T. LUKJANOVITSCH.
V. GUSSAKOVSKY.
A. REICHARDT.
W. LINDHOLM.
M. BURAKOVA.
I. D. STRELNIKOV.
J. PIONTKOVSKIĬ.

Zoological Institute of the Academy of Sciences of the Soviet Union.

To the
ENTOMOLOGICAL SOCIETY
OF LONDON.

The ENTOMOLOGICAL SOCIETY OF LONDON represents one of the greatest and most influential scientific bodies of the world. Its studies embrace the largest branch of zoology in all its numerous ramifications.

The immense work accomplished by the Society is a highly valuable deposit into the treasury of Zoological Science.

The scientific staff of the ZOOLOGICAL INSTITUTE OF THE ACADEMY OF SCIENCES OF THE SOVIET UNION are sincerely glad to join their felicitations to the congratulating choruses from every part of the globe addressed to the ENTOMOLOGICAL SOCIETY OF LONDON on the occasion of the Centenary of its existence.

Director. S. SERNOV.

Curator of the Division of Terrestrial Invertebrates.
A. KIRITSCHENKO

Secretary. E. GURVICH

Zoological Institute
of the Academy of Sciences
Leningrad, U.S.S.R.

SWITZERLAND.

The Swiss Entomological Society.

To the

ENTOMOLOGICAL SOCIETY

OF LONDON

DEAR CHAIRMAN,
LADIES AND GENTLEMEN,

THE SWISS ENTOMOLOGICAL SOCIETY is very glad to have the opportunity of congratulating the venerable ENTOMOLOGICAL SOCIETY OF LONDON on the occasion of its centenary. It desires to express its thanks and appreciation for all it has done to develop entomological science and for all the fructuous suggestions it has given to scientific and applied entomology.

THE SWISS ENTOMOLOGICAL SOCIETY hopes that the London Society may continue to flourish and that the first saeculum may be followed by many others for the advancement of science and for the prosperity of the nations.

THE SWISS ENTOMOLOGICAL SOCIETY expressing the wish that the old and long established friendship which unites these two societies in the same aim will continue and grow year by year still more intimate, addresses its most respectful greetings to the venerable assembly.

Zürich, May 3rd 1933.

IN THE NAME OF THE SWISS ENTOMOLOGICAL SOCIETY

The President : A. DE SCHULTHESS.

The Secretary : DR. AUGUST GRAMMANN.

Société de Physique et d'Histoire naturelle de Genève.

LA SOCIÉTÉ DE PHYSIQUE ET
D'HISTOIRE NATURELLE
DE GENÈVE

à

L'ENTOMOLOGICAL SOCIETY OF LONDON

à l'occasion de son

Centenaire

3 et 4 mai 1933

LA SOCIÉTÉ DE PHYSIQUE ET D'HISTOIRE NATURELLE DE GENÈVE présente à l'illustre SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES à l'occasion de la célébration solennelle de son centenaire, l'expression de son admiration pour l'effort considérable accompli par la SOCIÉTÉ ENTOMOLOGIQUE au cours du premier siècle de son existence.

L'une des premières de son genre en Europe, votre Société a puissamment contribué à unir des forces jusqu'alors trop éparpillées, à guider et à maintenir les entomologistes de votre nation dans les voies de la précision et de la plus grande probité scientifique.

Sous l'égide des KIRBY, WESTWOOD, DARWIN, MARSHALL, POULTON et de tant d'autres célébrités de la science zoologique, vous avez élevé l'entomologie au rang qu'elle mérite d'occuper parmi les sciences, tant par le rôle qu'elle a joué dans l'évolution des conceptions biologiques que par les services inestimables qu'elle a déjà rendus et rendra encore à l'humanité.

L'admirable série de vos " Transactions " est là pour témoigner de la fidélité et de la persévérance qu'a mises votre Société à l'accomplissement du programme que lui avaient tracé ses fondateurs il y a un siècle.

LA SOCIÉTÉ DE PHYSIQUE ET D'HISTOIRE NATURELLE DE GENÈVE s'associe à votre joie et à votre légitime fierté en reconnaissant l'ampleur et la valeur intrinsèque de votre œuvre séculaire. Elle forme des vœux pour la continuité des relations cordiales qui n'ont cessé de régner entre les entomologistes londoniens et leurs confrères genevois. Elle souhaite à la SOCIÉTÉ ENTOMOLOGIQUE DE LONDRES un avenir digne de son glorieux passé.

Le Président :
P. WENGER,
Prof.

UNITED STATES OF AMERICA.

Academy of Natural Sciences of Philadelphia.

To the ENTOMOLOGICAL SOCIETY OF LONDON.

Greetings :

With a common interest reaching back to one of its founders, THOMAS SAY, the ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA wishes to extend

to the ENTOMOLOGICAL SOCIETY OF LONDON its most cordial felicitations and sincere good wishes on this Centenary commemoration of the Society's foundation. As one of those organizations which trod the stony path of all scientific pioneers, the Academy appreciates most vividly the labours of those who brought the ENTOMOLOGICAL SOCIETY OF LONDON into being, and none recognize more fully the outstanding and distinguished leadership which your great Society has achieved through the past decades of devotion to entomological research. It is the earnest hope of our Academy, in which entomology has always been a major interest, that your Society, rich in service and tradition, may go forward through the years to come with the same outstanding energy for research and broad devotion to entomological progress, which have been so conspicuous in the fruitfulness of the past century of its activity.

JAMES A. G. REHN.
Secretary.

April 15 1933.

American Association of Economic Entomologists.

Greetings.

The AMERICAN ASSOCIATION OF
ECONOMIC ENTOMOLOGISTS extends to the
ENTOMOLOGICAL SOCIETY OF LONDON
most hearty congratulations upon the
completion of its first One Hundred Years
of organized activity. We hope that the
Society may continue long and grow
steadily in its happy associations
and in its helpful services to mankind,
with the study of insect life as its
inspiration and incentive.

At London, England,
May 3 1933.

W. E. HINDS.
President.

A. I. BOURNE.
Secretary.

EDWIN C. VAN DYKE.
Delegate.

American Entomological Society.

To the ENTOMOLOGICAL SOCIETY OF LONDON—

Oldest of existing Entomological Societies in English-speaking countries, surpassed in age by only one other in the world, renowed for the researches of its

members, the two KIRBYS, WESTWOOD, STAINTON, DARWIN, WALLACE, BATES, WALSINGHAM, GODMAN, SALVIN, TRIMEN, LUBBOCK, RYE, and a host of others, world-wide in its membership, prolific in publication extending the knowledge of insects,

Greetings

Resolved by the AMERICAN ENTOMOLOGICAL SOCIETY

in Philadelphia at this meeting of February 23, 1933, that we congratulate you on your one hundredth birthday and tender our heartiest wishes for your continued life, growth and furtherance of our common science.

Pres. ROSWELL C. WILLIAMS, Jr.
Corres. Sect. EZRA T. CRESSON, Jr.
Rec. Sect. RUDOLPH G. SCHMIEDER.

California Academy of Sciences.

CREDENTIALS

ENTOMOLOGICAL SOCIETY OF LONDON 1833–1933

This is to certify that

DOCTOR EDWIN C. VAN DYKE

Professor of Entomology at the University of California, and Curator Emeritus, Department of Entomology, and Patron of the CALIFORNIA ACADEMY OF SCIENCES, San Francisco, California, has been duly appointed to represent the CALIFORNIA ACADEMY OF SCIENCES at the centenary of the ENTOMOLOGICAL SOCIETY OF LONDON in May, nineteen hundred and thirty-three, and to extend to the Society greetings and congratulations upon past achievements, and best wishes for continued usefulness.

CALIFORNIA ACADEMY OF SCIENCES.
C. E. GRUNSKY.
President and Acting Director.

San Francisco, California.
March seventh
Nineteen hundred thirty-three.

Cambridge Entomological Club.

Dear Sirs:

The CAMBRIDGE ENTOMOLOGICAL CLUB, Cambridge, Mass., U.S.A., extends greetings to the ENTOMOLOGICAL SOCIETY OF LONDON on its Centenary celebration May 3rd and 4th, 1933.

This introduces Dr. GEORGE SALT, Department of Zoology, Caius College, Cambridge, ENGLAND, who has been chosen to represent the CAMBRIDGE ENTOMOLOGICAL CLUB on this important occasion. We appreciate being

invited to participate in your hundredth anniversary celebration and wish for the Society continued success in furthering the cause of the science of entomology and the dissemination of scientific findings pertaining to it.

Yours very truly,

C. W. COLLINS
President
Cambridge Entomological Club.

April 20 1933.

Cornell University.

To the President and Fellows of the
ENTOMOLOGICAL SOCIETY OF LONDON.

CORNELL UNIVERSITY sends greetings and congratulations on the completion of one hundred years of distinguished service. We count the Society's contributions to entomological science a priceless heritage, and we are proud to share in its tradition. We join today in grateful recognition of the inspiration the Society's great leaders have furnished to our science in America and throughout the world and we hope that its eminence and prosperity may be maintained through centuries to come.

LIVINGSTON FARRAND.
President

Entomological Society of America.

To
The ENTOMOLOGICAL SOCIETY OF LONDON
on the occasion of their
One Hundredth Anniversary
in appreciation of the enduring
contributions to science that
have been made by their members,
and in the assurance of their continued and effective collaboration
in the field of entomology,

GREETINGS

from

THE ENTOMOLOGICAL SOCIETY OF AMERICA

With the accord of
The Executive Committee

H. B. HUNGERFORD
Secretary-Treasurer

R. E. SNODGRASS
President

Entomological Society of Washington.

To THE ENTOMOLOGICAL SOCIETY OF LONDON:

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON, now approaching its fiftieth birthday, congratulates its venerable and illustrious predecessor, THE ENTOMOLOGICAL SOCIETY OF LONDON, on its near centenary. As is the case with all of the other entomological societies of the World, we of the Washington group have gained guidance and inspiration from the old and famous London Society. We wish, most heartily, a long and illustrious existence to the London organization.

For THE ENTOMOLOGICAL SOCIETY OF WASHINGTON,

S. A. ROHWER.
Corresponding Secretary.

L. O. HOWARD.
Honorary President.

CHAS T. GREENE.
President.

Washington, D.C., U.S.A.,
April 6 1933.

The University of California.

TO
THE ENTOMOLOGICAL SOCIETY OF LONDON
GREETING

THE UNIVERSITY OF CALIFORNIA sends its greetings to the ENTOMOLOGICAL SOCIETY OF LONDON on the occasion of the Centenary of the Society to be celebrated on May the third and fourth, nineteen hundred and thirty-three.

To avail itself of the opportunity to be represented on this occasion, THE UNIVERSITY OF CALIFORNIA has appointed

as its delegate

EDWIN COOPER VAN DYKE, M.D.

Professor of Entomology

Given at Berkeley on the third day of February, in the year of Our Lord the nineteen hundred and thirty-third, and of THE UNIVERSITY OF CALIFORNIA the sixty-fifth.

ROBERT G. SPROUL.
President of the University

G. F. Herbert Smith, N. D. Riley, R. Adkin. ————, Ll. Lloyd,
E. E. Austen, Said eff Bahgat, F. C. Willcocks, ————, G. D. Hale Carp
P. I. Lathy, J. Richardson, R. Stewart MacDougall, Sir T. Hudson Beare, Sir Guy A. K. Marsl

J. Ramsbottom, E. Rivenhall Goffe, B. P. Uvarov, C. G. M. de Worms, T. R. Eagles, R. T. Leiper, E. Hindle, J. G
ıenter, R. N. Chrystal, B. M. Hobby, W. H. Evans, C. B. Williams, E. E. Edwards, H. W. Miles,
ıall, E. Wace Carlier, A. Alfieri, T. G. Munster, E. C. Van Dyke, E. Titschack, P. Lesne, C. Bolivar y Pie

r, J. E. Collin, C. J. Wainwright, W. S. Patton, ————, ————, H. Main, M. L. Thom
oll, ————, C. Tate Regan, A. T. Hopwood, A. E. Salisbury, H. S. Soliman R. W. Robbins, R. A. H
R. Oberthür, S. A. Neave, E. B. Poulton, Lord Rothschild, L. Masi, Mrs. Uyttenboogaart, 1

DELEGATES TO THE CENTENARY MEETING.

pson, J. Millot, P. Brien, M. MacDonald, M.P., E. M. H. Lloyd, J. W. Munro, V. B. Wigglesworth, H. Scott,
arper Gray, ————————, W. G. Freeman, W .E. Cox, J. V. Pearman, R. C. Fisher, F. W. Edwards, H. W. Bedford
). L. Uyttenboogaart, Miss I. M. Roper, Miss A. M. Evans, R. F. Scharff, Mrs. Crawford, W. M. Crawford, I. P.

Blood, A. W. Rymer Roberts, L. Berland, G. Talbot, D. Keilin.
P. Vayssière, L. Chopard, F. Le Cerf.
, P. P. Graves, E. Roubaud, Mrs. Biedermann, R. Biedermann.

Wednesday, June 7th, 1933.

Professor E. B. Poulton, F.R.S., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society:—J. K. Chorley, The Department of Agriculture, Salisbury, S. Rhodesia; A. Cuthbertson, The Department of Agriculture, Salisbury, S. Rhodesia; K. Mellanby, The London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 1; D. Raichoudhury, The Department of Entomology, The Imperial College of Science and Technology, South Kensington, S.W. 7; M. T. El Sayed, The Department of Entomology, The Imperial College of Science and Technology, South Kensington, S.W. 7.

The President said: "At this, the first meeting after our Centenary, I am sure that the Fellows of the Royal Entomological Society of London, including those who cannot be present, will wish to express their gratitude by passing a hearty vote of thanks to all the friends whose generous help was essential to the success of our Celebrations. Some of these friends we were able to thank at the time; others whose kindness could not be thus gratefully acknowledged have received letters on behalf of the Society. On this occasion it is a pleasure as well as a duty to thank them all once more—The Council of the Royal Geographical Society, for the use of the rooms for the General Meeting; The Institutions, Societies and Universities, British and Foreign, by whom Addresses of Congratulation were sent, and the Delegates who presented them; The Exhibitors at the evening Conversazione in the Society's rooms; The Trustees of the British Museum, for the Reception in the Natural History Museum, and Lord Crawford and Balcarres for his Address of Welcome on their behalf; also the Trustees, for the opportunity of photographing the Delegates in the grounds of the Museum; The President and Council of the Zoological Society of London, for the pleasure and comfort enjoyed by the Delegates at the Zoological Gardens and at Whipsnade, and to Sir Peter Chalmers Mitchell for the admirable arrangements that were planned and carried out; Lord Rothschild, for the Delegates' visit to his splendid Museum at Tring and his generous hospitality; His Majesty's Government, for the Reception given to the Delegates and Fellows of the Society at Lancaster House, and the Rt. Hon. Walter Elliot, M.C., M.P., for receiving the guests.

"I now propose from the Chair a hearty vote of thanks to all those who have given the kind help I have briefly mentioned, trusting that the Fellows present will carry it by acclamation, not only on their own behalf but also on behalf of those who cannot be here."

The vote was carried by acclamation.

The President then said that he was sure the Fellows would wish to thank those among them who had given special help during the Centenary Celebrations—Mr. C. L. Collenette who had organised the exhibits in the Society's rooms; Dr. Karl Jordan who had done so much for the enjoyment of the Delegates at Tring; above all, the Hon. Sec., Dr. S. A. Neave, on whom had fallen "the burden and heat of the day," indeed of the many days and months during which the Celebrations were planned,—the labour by which, ably assisted by the Registrar, he had laid the foundations of a great and memorable success. He proposed a vote of warm

thanks to those he had named, especially to Dr. Neave, and he believed that the Fellows present would wish to carry it by acclamation.

The vote was then carried by acclamation.

The President wished in conclusion to thank all the Fellows who took part in the Celebrations for the friendly spirit which inspired every meeting and had made the Centenary a pleasant and, he believed, a life-long memory.

Exhibits.

Notes on Butterfly Dispersal and Migration.

The President communicated the following notes received from friends :—

Mr. R. A. Lever writing from Tulagi, British Solomon Islands, on 5 March, 1933, recorded the following observation :—" While sailing from Fulakora to Tulagi we passed a *Euploea* making for one of the small islands only marked on a large chart. It was at least a mile from the nearest land and at first flying strongly but gradually sank lower and lower until after a few landings on the surface, it did not rise again and must have failed to make the island by a hundred yards or so."

Canon St. Aubyn Rogers wrote 27 March, 1933, from Nairobi :—" There has been another migration of *Belenois mesentina* this month, 18th to 22nd. The direction was S.E. to N.W., the wind being steady from N.E."

Further Notes by Miss E. A. Oehlenschlaeger on the food of the Purple Martin.

The President said that he had received a letter, written 27 March, 1933, by Miss Oehlenschlaeger, amplifying in some points the account of her interesting observations recorded in 1932 (1933) *Proc. Ent. Soc. Lond.*, **7** : 98–100, and kindly offering to send a reel of film showing the birds in motion. He very much hoped that it would be possible to arrange for its display at one of the autumn meetings.

The intimate and yet entirely free association between the young Martins and their human friends was especially evident at a time when food was difficult to obtain and the birds, although at liberty during the day, refused to hunt for themselves and were in danger of death from malnutrition, as described in the following interesting extract from Miss Oehlenschlaeger's letter :—

" I find that from August 26 [1931], when the difficulties of food insufficiency began, due to the inability to secure more meal-worms, the advice of Mr. Gromme, Biological Survey Director of Milwaukee, was to give up feeding them altogether ' and compel them by hunger to do their own hunting.' But they would *not* hunt : they drooped about the porches, awnings, housetop, or any other perch, and we were heart-sick when we realized that we could not catch enough acceptable insects. When we became desperate in our hunting it was decided to gather the brilliantly coloured butterflies and cut off their wings, offering the birds the mutilated bodies —but days of very short rations for them did not whet their appetites sufficiently to make this food desirable, and I was glad to be able to discontinue a very distasteful experiment. It was during these days, from August 26–Sept. 3, that the signs of malnutrition began to develop—rickets. Also, at this time, we placed candles on the inside of our great landscape windows at night and captured all the moths we could gather—literally hundreds of the small, nearly white varieties, which go toward the light on summer evenings. I feel confident that it was this

one, very sufficient meal at night before going to bed that saved the birds from serious disaster. On the third of September meal-worms again became available and the remaining youngster was permitted to gorge—the result being entirely satisfactory to bird and man.

"May I be permitted to re-state at this time that, with the exception of the protection which the birds were given at night by being brought into the house, they were absolutely free, as you will be able to see from the moving picture film."

Two of the three Martins which migrated on 15 September, 1931, and returned in the following spring as recorded in *Bird-Lore*, **34** : 245–252, were, Miss Oehlenschlaeger had informed him, identified by their bands. They had, however, unfortunately grown out of their youthful familiarity with their benefactors.*

***Polybia fasciata*, Sauss., the Trinidad Wasp which built its nest on an electric light bulb.**

The President exhibited six examples of the wasp, determined by Mr. R. B. Benson from imperfect material as *Megacanthopus* sp. (1933, *Proc. Ent. Soc. Lond.*, **8** : 7), but after the examination of these good specimens, named by him *Polybia fasciata*. They were received from Mr. P. Lechmere Guppy, with his letter of 9 May, 1933, containing the following interesting information :—

"I have only just been able to get you half a dozen specimens of the wasp, *Megacanthopus* sp. with nest and young. I have put them in a small tin box and hope they will reach you undamaged. The bulb certainly gets very hot after an hour, and too hot to hold after 10 minutes. I understand it is a 40-watt light. This wasp frequently makes its nest against the lamp-shades indoors, and like *Polistes canadensis*, L., seeks convenient spots in dwellings around this locality, becoming rather a nuisance at times, although not nearly so bad as *Polistes*" (1932, *Proc. Ent. Soc. Lond.*, **7** : 67, 68).

"The Society of Entomologists of London for the Study of Insects" : 1780–1782.

The President exhibited the manuscript Diary and rough draft of the Proceedings of this very interesting predecessor of the Royal Entomological Society, together with another important notebook and a copy of Haworth's "Prodromus" containing manuscript notes by William Jones, all presented to Oxford University by his friend Dr. F. Dawtrey Drewitt, M.A., D.M., F.R.C.P., Christ Church. The four books were formerly in the possession of William Jones of Chelsea, who had written the greater part of the Diary and Proceedings and the whole of the manuscript in the other two. The notebooks are approximately 8 in. × $6\frac{1}{2}$ in. in size and thus slightly larger than the "Prodromus."

The Diary and manuscript "Notes on British Insects, especially Lepidoptera, 1780–85," including also extracts copied from Drury's Journals, 1764–66, were presented in May, 1925, together with the six priceless volumes "Jones' Icones," acknowledged by the vote of Convocation 2 June, 1925, and briefly described in the "Report of the Hope Professor of Zoology, 1925" (1929, *Hope Reports*, 1925–

* Miss Oehlenschlaeger wrote, 19 August, 1933 : "I was not able to identify any martin of the quartette this year. These birds may have suffered the fate met by hundreds of their kind."—E.B.P. 21 Sept. 1933.

29, Vol. XV, No. 25, pp. 17, 18). The Proceedings and "Prodromus Lepidopterorum Britannicorum," by a Fellow of the Linnean Society, 1802, interleaved, with manuscript notes by William Jones were presented 5 June, 1933. The "Prodromus" is known to have been written by A. H. Haworth, who, as Dr. Drewitt wrote, "lived in Chelsea and was a great friend and admirer of William Jones, as may be inferred from the preface of his 'Lepidoptera Britannica' (1803), the work in which he admits the authorship and also that he was the founder of the Aurelian Society."

A remarkably detailed history of the Society of Entomologists of London can be built up from the notes recorded in the Proceedings and the Diary, neither being complete without the other, and it is a source of great satisfaction and confidence that so much of the manuscript was written by William Jones himself. In this year of the Centenary of the Royal Entomological Society it is especially fortunate that the generosity of Dr. Drewitt has permitted so full an account of the earlier Society to appear in our Proceedings.

The rough draft, evidently taken down at the meetings, and referred to in this account as "Proceedings," records Elections of new Members, Rules and modification of Rules with, as the principal entries, the English names of Lepidoptera and occasionally other insects (sometimes with scientific names), grouped under the weeks in which they were bred, seen or captured, &c. These weekly lists evidently represented the material exhibited or described at the meetings. The names, jotted down in the Proceedings, were then carefully written in the Diary where they were arranged, generally under the headings "Bred"; "Taken," "Took" or "Moths out"; "Flys" or sometimes "Flies," indicating butterflies; and "Insects," for any non-Lepidopterous species, of which very few were mentioned. The flowering and coming into leaf of a few plants and the spinning up and other events in a few life-histories were recorded as "Observations." All these categories sometimes appear without headings. Precise dates and the names of observers or exhibitors are very rarely mentioned in the Diary, oftener in the Proceedings. Occasionally, however, additional details are given in the Diary which also contains the lists for the first three weeks of June, 1781, altogether omitted from the Proceedings (p. 99).

The following statement appears on the first written page of the Diary recording the first Meeting of the Society, here without date, but shown by the Proceedings to have been held on 9 May, 1780.

"We who have hereunto Subscribed Do hereby Promise each for himself that we Will endeavour to promote the Good of the Society of Entomologists of London for the Study of Insects and to Pursue the Ends for which the same was founded That we Will be Present at the Meetings of the Society as often as conveniently We can especially at the Anniversary Elections and upon extraordinary Occasions and that We will observe and abide by the Statutes and orders of the said Society Provided that We have Liberty to withdraw ourselves from the Society Whenever We think proper by signifying such our Intentions to the President of the Society for the Time being by Letter."

Seven signatures, in the following order, are subscribed to this statement:—

D. Drury [President], W^m^ Honey [Vice-President], John Swift [Assistant], John Francillon, Ralph Tinley, W^m^ Jones [erased : Secretary], Joseph Bentley.

The offices held by four members have been added from the Proceedings in which it is obvious that Swift was Assistant Secretary, his name following that of W^m^ Jones, the Secretary.

The Proceedings make it probable that the above statement to which the seven signatures were subscribed was, at any rate at the time of this first meeting, the one and only Statute of the Society; for they record, after the date, " May the 9th, 1780," and the seven names (not signatures), that " The Statutes of the Society was read and agreed to." That the plural was given to " Statute " in error is suggested by the verb, as also by the single paragraph in which the statement appears in the Diary. On the other hand since "Statutes and orders " are mentioned in the paragraph it is possible that each of the promises and conditions was held to be a Statute or an order.

A note by Dr. F. D. Drewitt, referring to the erasure of William Jones' signature, states that " W^m^ Jones resigned his membership from June 1781 till Ap. 1782, during which time the Club met on Sundays." The Proceedings and Diary contain no mention of meetings on Sunday, and the Minute of 8 Jan. 1782 records the agreement to Tuesday meetings " as usual " (p. 100), confirmed by twenty-two dates of meetings between 9 May, 1780, and 8 Jan. 1782, both inclusive, all of which have been kindly examined by my friend Dr. J. K. Fotheringham and found to be Tuesdays. To these must be added " the last Tuesday in July " 1781 (p. 100). On the other hand, the handwriting of the Diary changes after the lists for the 4th week in May 1781, while the lists for the 1st, 2nd, and 3rd weeks in June, present in the Diary are, as stated on p. 98, omitted from the Proceedings, which pass abruptly from 4th week in May to 4th in June. Furthermore 21 dates of meetings are minuted up to 24 April, 1781, and, after it, only one (8 Jan. 1782) together with the last Tuesday in July 1781. These facts appear to support the conclusion that a change came over the Society in June 1781, although the evidence is all against its cause being an alteration in the days of meeting. It is possible that collecting expeditions on Sundays may have been the reason for William Jones' withdrawal. Dr. Drewitt has been unable to find any further evidence, but " remembers the statement in which William Jones said that he would resign his membership of the Society if it was decided to meet on Sundays. He had strong feelings about Sunday being a day of rest." The fact that both note-books remained in his keeping after the dissolution of the Society entirely confirms Dr. Drewitt's note in the Diary implying that the breach was healed in April 1782. Further light on the incident might be gained by an expert in handwriting who, in any case, would be sure to add to our knowledge of the Society. There can be no doubt that most if not all the earlier parts of both books were written by William Jones himself.

The following important information concerning the meetings, elections, &c., is contained in the Proceedings, following the entry on 9 May, 1780 (p. 98) :—

30 May & 27 June, 1780.—Names of all seven members; *11 July*—Names of all except Tinley; *25 July*—" All but Drury. Visitor Mr. Coventry "; *8 Aug.*—" All but Drury "; *29 Aug.*—" All the Society "; *12 Sept.*—" All except Mr. Bentley "; *26 Sept.*—" All except Mr. Jones."

10 Oct.—" All but Mr. Bentley. Visitor Mr. Church. . . . Mr. John Church of Islington, Surgeon is Proposed as a Member of this Society by D. Drury [and] Will^m^ Honey," whose names are signed, as also those of other proposers mentioned below.

Some dated captures, &c., recorded for this meeting are omitted from the Diary, including the breeding of a Lymantrid from " A moth Caterpillar beat at Darnwood 6 of May. Like at that time the Nuttree tussock on the 10 it changed its last skin then very like the Gipsy. Spun up 20 June in a Slight Web Crysalis of a Pea Green bred 14 Aug^st^, Perfectly white like the Sattin about same Size with a small black Mark on the disk of the Wing like a C."

31 Oct.—" All but Mr. Jones . . . Mr. John Church proposed & passed Nem. con."

14 Nov.—" All but Mr. Jones. Visitors Mr. Pickersgill & Mr. Beckwith. Proposed Mr. Thos. Pickersgill, W^te^ Lyon Street, Norton falgate—R. Tinley, John Francillon."

" Proposed Mr. John Beckwith of Lant Street, Southwark—John Francillon, Ralph Tinley."

28 Nov.—" All but Mr. Jones & Mr. Church."

12 Dec.—" All but Mr. Church & Mr. Bentley. Mr. Thos. Pickersgill & Mr. John Beckwith Balloted for & chosen."

9 Jan., 1781.—A list of the ten members on this date includes the three recently elected and records Drury as President, Tinley Vice President, Swift Secretary, and Beckwith Assistant Secretary. " All Present but Mr. Bentley, Mr. Pickersgill, Mr. Church."

2nd Week July.—" Mr. Smith propos'd By Mr. Tilney [Tinley] & J. Swift—first time."

" Mr. Smith proposed a 2nd Time & passed Nem. con.—the last Tuesday in July—J. Swift."

" *Nov^r^. [1781].*—Agreed that this Society be removed from the present Place of Meeting to the Bank Eating House in Throgmorton Street."

" *Jan^y^. 8, 1782.*—Agreed that this Society do in future meet twice a Month from the Beginning of March to the End of September as usual viz. the Second & Last Tuesdays in the Mo[nth] & from the End of September to the Beginning of March only once a Month viz. the Sec'd Tuesday in the Month.

" And it is likewise further Agreed that while the Nights of Meeting are once a Month the Fines for Absence shall be one Shilling.

" This being the first Meeting in the Year Officers were balloted for, when Mr. Drury was Chosen President, Mr. Bentley Vice President, Mr. Beckwith Assist. Secretary, Mr. Swift Secretary."

At the undated meeting which records the following observations only :—" 1st Week April [1782]—Almond Tree in Bloom. Taken—The February Shoulder Stripe "—it was " Resolved unanimously that in future this Society do meet only on the second Tuesday in every Month & that one Shilling be then spent by every present Member & the Fine for absence be likewise one Shilling."

Apart from the extremely interesting (unnumbered) page containing the Statute or Statutes and the signatures, the Diary is a beautifully written record

of observations during many of the weeks in the years 1780–1782, occupying the numbered pages 1 to 67. The method followed and briefly described on p. 98 will be best illustrated by quoting the whole of the names written on the first page and many of those on the second, the two pages containing a record of the observations and specimens discussed or exhibited at the first meeting of the Society. Both pages are headed " 1st Week in May 1780."

Page 1 contains " Observations—Peartrees in full bloom, Dandylion coming into bloom, Oak just Shows the Leaves," followed by " Bred—Angleshade, Swallow Prominent, Emperor, Water Betony, Hebrew Character."

These names are written in columns inset after the words " Observations " and " Bred," as also the names after the three headings on p. 2, *viz.* " Moths out," followed by the English names of 12 moths and " Two different specimens of Small Geometra "; then " Flys," followed by " Speckled Wood, Orange Tip, Green Vein, Azure "; finally " Insects," followed by " Hemerobius, Cicindela Campestris."

The earlier pages of the Diary are written in the above form, the left-hand page recording emergences and oviposition of moths, spinning of caterpillars and, in some weeks, the flowering of plants or trees; the right-hand page recording the moths, butterflies and occasionally other insects observed in the wild state. Their condition is sometimes noted, the word " wasted " being used when we should say " worn." Later pages are more condensed, with a single page or sometimes part of a page to a week, but the spacing is so generous that the total number of records is not large, as may be inferred from the contents of pages 1 and 2 which may be taken as a fair sample of a rather full week's record.

More complete data with the names of members or other naturalists are so rarely given that the relevant parts of all such entries have been copied and are quoted below, the only difference in the arrangement being to print the names of insects continuously with commas between them instead of in columns, requiring far more space, to use italics for the weeks and to add additional information in brackets, from the Proceedings.

1780. " *1st Week in June*—Took several Caterpillars at Leeson Abby [Abbey] Wood near Erith feeding on the Cowheat found generally on dead leaves on the Ground and in the most retired places. . . . It produced in 14 days the Pearl body likeness.* . . . [The Crysis or Ruby hornet alias Ruby Tail]."

1780. " *2nd Week in June*— . . . Eliphant [Bred Mr. Francillon] . . . White Pinion Vaneer [—new—at Leason Abbey] . . . A Sphinx taken by Mr. Curtis on the Poplar about the size of a large Wasp Clear Wing [The Poplar Sphinx alias Vespa formis—Curtis]." Brief description follows in Diary.

[Meeting 25 July] 1780. " *2 Week July* [to the 15th]—Bred a Second breed of Ruby Tygers from Eggs hatched on the 29th May " [date omitted from Proceedings].

1780. " *3 Week July*—Painted Lady Spun up, Alderman Do. . . . Out White Admirable " [these records omitted].

[Meeting 29 August] 1780. " *2d Week August*—Privets went into the Earth [14 Aug.]. Moths: Red Underwing [13th], beautiful hornsey beauty [14th]. *Flys :* Brown Hairstreaks, 13th [12 taken], Azure [13th]."

* A brief description of the larva is omitted. The name " Pearl border likeness " is given elsewhere.

[Meeting Sept. 26] 1780. "*3rd Week in September*— . . . Black Spotted Pinion [Mr. By = Bentley], Clouded Sallow, [omitted]." At the same meeting, among the records for the 4th Week in September the Proceedings give "J.S." (John Swift) as the authority for "Brown hair streak still good" of the Diary.

1781. "*February 13th*—Brought some Non-Descript Moths which were named as under"—"The Silver Cloud, a Noctua" and the "Pretty Widow, a Geometra," both taken at Charlton, 16 May, by Mr. Honey; the "Brown Ermine, a Tortrix," taken Oct. 10, the "Black Sprigg'd, a Tortrix," about 20 Sept., and the "Dark Clouded Pinion, a Tortrix," about middle of August, all taken "at the Forest" by Mr. Bentley. Lastly the "Gold Arches, a Noctua, Size $1\frac{3}{4}$ Inch," but no other data, by Mr. Francillon.*

The additional information sometimes supplied by the Proceedings is well illustrated in the record of a meeting [held 13 Mar.] with the heading "2nd Week March," 1781—"*Bred:* a large dark Quaker [10 Mar., Tilney for Tinley, as also below], March Dagger [11 Mar., several—Church]; *Taken:* Spring Usher, Dotted Border [several of both out, in good order], Early Grey, A Noctua [11 Mar., these words probably intended for a single specimen], Herald [11 Mar., supposed to have lived all the winter], Cicindela."

1781. "*2nd Week June*— . . . An Ephemeron with 2 Setae. Mr. Drury."

1781. "*4th Week June*— . . . Waved Snout. Mr. Swift at Leeson."

1781. "*1st Week July—Bred*— . . . Silver Y [Tilney] . . ., *Taken*—Peach Blossom [Mr. Franc^{n}], . . . Purple Emperor." Both these with "plenty" of Large and Small Emerald "at Comb Wood."

1781. "*The 2nd Week October*"—contrasted with the above, Tinley, again rendered "Tilney," is recorded as breeding The Sword Grass Moth, in the Diary alone.

1781. Going back to "*4th Week in August*— . . . Green Oak of Honor Beauty, a new Moth ['named' as above] taken by Mr. Pickersgill at the Oak of Honor. Unicorn Sph. Taken in Mr. Bentley's House at the Forest." This latter appears in the Proceedings under "1st Week Sept. . . . flew into his House there, between 9 & 10 o'clock."

The last weekly lists on pages 66 and 67 are quoted in full below.

1782. "*Last Week June*—Took The Mazarine Blue—Plenty at Horsington in Dorsetshire. Saw the Swallow Tail Fly."

1782. "*1st Week July*—Taken, The Margate Beauty, Mr. Francillon."

1782. "*Last Week July*—Taken the Irorella, or Dew Moth, upon the Common opposite the 18 Mile Stone, Erith."

1782. "*1st Week August*—Bred [Taken] The Sea Wormwood Lackey—20 of the Caterpillars were taken by Dr. Curtis at the Isle of Sheppey—They remained in Chrysalis 30 Days. Taken, The Small scarce Emerald at Darn Wood, Dartford. The Christiana—Wasted [Aug. 3]—at Darnwood, where it was taken fine a fortnight before. The Rose Vanear, Wasted [Aug. 3]."

The entries in the four preceding paragraphs, allowing for differences in the order and an obvious slip in the use of the word "Taken" for "Bred" in the Proceedings, are essentially similar in both notebooks.

* Sizes of the first two moths and very brief descriptions of two Tortrices are omitted. The "Gold Arches" is apparently recorded for 4th week in Febr., in the Proceedings.

English names in MS. of William Jones.	Names in "Prodromus" with Nos. of page and species.	Modern equivalents determined by W. H. T. Tams.
Large Aurelians Plague	Clavaria 22 : 51	Larentia clavaria, Haw.
Aurelians Plague	Chenopodiaria 22 : 52	Ortholitha chenopodiata, Linn.
Chimney Sweeper ["Chimney Sweeper's Boy" in Diary, pp. 4, 51]	Chaerophyllata 27 : 65	Odezia atrata, Linn. (=*chaerophyllata*, Linn.)
Jepthah's Daughter	Nubiculata 25 : 13	Bapta temerata, Schiff. (see Haw. Lep. Brit. p. 355, and Prout in Seitz Palaearct. iv. p. 315)
Pretty Widow	Decussata, D.* 28 : 73	Schistostege decussata, Schiff.
Grass housewife	Viridata 28 : 71	Chlorissa viridata, Linn.
Large Huswife	Margaritaria 21 : 25	Campaea margaritata, Linn.
Green Huswife	Thymearia 21 : 29	Thalera fimbrialis, Scop.
Old Lady	Maurina 11 : 2	Mania maura, Linn.
Old Gentlewoman	Brassicina 18 : 135	Barathra brassicae, Linn.
Small old Gentlewoman ["Little" in Diary, p. 47]	Phoebina,† B. 18 : 148	Apamea oculea, Linn.
Common hornsey beauty	Centum notatata 25 : 26	Cidaria truncata, Hufn., ab. centumnotata, Schulze.
Yellow hornsey beauty	Comma notata 26 : 27	Cidaria truncata, Hufn.
Beautiful hornsey beauty	Punctum notata 26 : 28	Cidaria citrata, Linn., ab. immanata, Haw.
Dark hornsey beauty	Immanata, B. 26 : 29	Cidaria citrata, Linn., ab. immanata, Haw.
Hornsey Carpet	Interruptata,‡ B. 26 : 34	Cidaria corylata, Thunb.
Richmond Beauty	Syringaria, H. 22 : 38	Phalaena syringaria, Linn.
Coney-hatch Thorn	Advenaria, H. 22 : 47	Cepphis advenaria, Hübn.
Miller of Mansfield	Leporina 17 : 122	Acronycta leporina, Linn.
Ealing glory	Oxyacanthina 16 : 93	Meganephria oxyacanthae, Linn.

* "D" = Donovan. The "Prodromus" adds letters indicating authorship to a very small proportion of the names. Of the two other letters appearing in the present list, "H" = Hübner and "B" indicates an undescribed species from Britain. Mr. Tams has come to these conclusions from the statement in the preface of the "Prodromus" (p. ii) confirmed by J. H. Durrant's pencil note in the Walsingham copy: "B = sp. n."

† Mr. Tams writes—"*Phoebina* caused me a lot of hunting, but the final decision seems to be all right. Haworth himself, and Werneburg later, both made a mistake which rather upset me when I came upon it. Even now some people will be shocked, but that is inevitable."

‡ He also informs me that "*Interruptata* necessitated a search through the 'Lepidoptera Britannica' species by species. Here is the 'elucidation' as Haworth might say."

The general, indeed wellnigh exclusive use of English names for British Lepidoptera by the early naturalists up to the closing decades of the eighteenth cen-

tury is clearly shown by these two and other manuscript notebooks written by William Jones, including his copy of Drury's Notes (p. 97). As more and more species came to be recognised quaint English names became still more quaint when adjectives were added to them or when they were made to serve again by the addition of "likeness," not unknown at the present day and then quite common. Furthermore, many existing names were used with a difference or applied to different species. Thus the Red and White Admirals were "Admirables," the Grayling was the "Grayline." The "Marble White" was *daplidice* while *galathea* was "marmores."

While there can be little or no doubt about the butterflies represented by the old English names it is very different with the moths, but fortunately for this interesting department of Entomological history, William Jones has carefully added them in manuscript to the corresponding scientific names in his copy of Haworth's "Prodromus." It is to be hoped that his complete list may be published in the near future, but in the meantime twenty interesting examples—eleven quaint and nine evidently dedicated to localities in which the moths occurred—are printed on p. 103. The spelling and capitals (or their absence) of his beautiful print-like script have been retained. The determination of the modern names of which Haworth's are synonyms was kindly undertaken by my friend Mr. W. H. T. Tams.

"Insect-catchers" formerly used by William Jones of Chelsea.

The Hon. Secretary, Dr. S. A. Neave, exhibited a pair of Insect-catchers formerly used by William Jones of Chelsea in the 18th century. These had been presented to the Society by Dr. F. Dawtrey Drewitt, a collateral descendant of the original owner.

A rare Syrphid fly.

Mr. O. W. Richards exhibited *Calliprobola speciosa*, Rossi, ♂, captured at Windsor Forest, Berks, 21 May, 1933. The species has hitherto scarcely been known in this country outside the New Forest, but was recorded by Mr. Donisthorpe, also from Windsor, in 1932, *Proc. Ent. Soc. Lond.*, **7** : 40.

A stridulating weevil.

Mr. O. W. Richards stated that a specimen of the beetle, *Ceuthorrhynchus pleurostigma*, Marsh., captured at Slough, Bucks, 4 June, 1933, was heard distinctly to stridulate, both in the field and in the laboratory. Apparently this habit has not been recorded before.

Resemblance between species of *Aletis* and *Euphaedra*.

Professor Hale Carpenter said that comparison between the two species of the Geometrid moth *Aletis* which were resembled by *Euphaedra* suggest that each had approached the other in the headquarters of the other's area. The coloration of these well-known aposematic species consists of a red-brown ground-colour surrounded by a black margin in which are white spots and a white subapical bar. Attention was paid to the following points :—

1. Depth of hue of the ground-colour.
2. Breadth of the marginal black of the hind-wing.
3. Character of the proximal edge of the black margin.

In addition, the spots forming the white subapical bar of the fore-wing and the proximal edge of the subapical black were found to vary, but not concomitantly with the other points.

The species concerned are *A. erici*, W. F. Kirby, and *A. helcita*, L., the former being very much commoner in Uganda, the latter being more abundant in W. Africa than in Uganda.

An account of these species and their larvae was given in *Proc. Ent. Soc. Lond.*, **1912** : iii; **1914** : l–li and liv, and an observation on the probable distastefulness to a Gecko was published in *Proc. Ent. Soc. Lond.*, **1913** : xxi; a record of distastefulness to fowls in 1930, *Proc. Ent. Soc. Lond.*, **5** : 40.

Aletis helcita occurs in three forms :—

1. *A. h. dissoluta*, Gaede.

Colour dark brownish-orange, the darkest of all the forms now considered. The hind-wing marginal black border of 5–7 mm. breadth, its inner edge strongly dentated or crenulated. The four spots in the subapical black are discrete, though more distinctly so in the male ; the proximal edge of the subapical black patch is strongly bowed in at the apex of the cell, though this also is more a character of the male than of the female.

2. *A. h. helcita*, L.

Distinctly paler in the female than *dissoluta*. Hind-wing black border 5–7 mm. broad, proximal margin strongly crenulated. Subapical spots on the fore-wing form a bar, though often the two anterior and the two posterior are separated in two pairs by a black nervule. The proximal edge of the subapical black is on the whole not so markedly bowed in as in *dissoluta*, though there is no absolute distinction in this respect.

3. *A. h. contractimargo*, Prout.

Slightly paler than *h. helcita*; hind-wing black border only 4–5 mm. wide, and crenulated proximally. Proximal margin of the fore-wing subapical black bowed in the middle.

Aletis erici occurs in two forms :—

1. *A. erici euparypha*, Prout.

In tint inseparable from *helcita contractimargo*, and with the hind-wing black border of the same width, 4–5 mm. But its proximal edge is only very slightly crenulated. In both forms of *erici* the four anterior white spots of the fore-wing blend to form a bar more perfectly than in *helcita*.

2. *A. erici erici*, W. F. Kirby.

The palest of all the forms mentioned above. The hind-wing black border only 2–4 mm. wide, and its proximal edge not at all crenulated, though it may undulate slightly. The proximal edge of the fore-wing subapical black is more strongly bowed inwards than in *euparypha*.

It appears from the above that the very dark *h. dissoluta* with broad, strongly crenulated hind-wing border, passes through *h. helcita*, which is paler but similarly broad-bordered, to *h. contractimargo* with narrower border (and considerably paler). The latter form is difficult to distinguish from *erici euparypha* (as pointed out by

Prout, 1916, *Nov. Zool.*, **23**: 273), but differs from typical *erici erici*, which is paler and has a much narrower hind-wing border not at all crenulated.

The point of chief interest is that the distribution of these five forms suggests that interaction has taken place between them. The typical pale *erici erici* of Uganda and the south end of Lake Victoria has associated with it the less abundant palest, eastern, form of *helcita*, namely *contractimargo*, the hind-wing border of which is like that of its associate in width, and can only be distinguished by its proximal crenulation.

On the other hand, the western form of *erici*, *e. euparypha*, found in the Congo Gold Coast, S. Nigeria, and Cameroons, appears to have followed the western form of *helcita* (*h. helcita*) in darkening of colour and broadening of the hind-wing black border, and even, to a slight degree, in crenulation of the proximal edge of the border.

	helcita	*erici*	*helcita*	*erici*
h. dissoluta	*h. helcita*	*e. euparypha*	*contractimargo*	*erici*
W. Africa	W. Africa	Congo	Uganda	Uganda
		Gold Coast	S. Sudan	S. end
		S. Nigeria		Lake
		Cameroons		Victoria

The species of *Euphaedra* most resembling *Aletis* are *ruspina*, Hew., and *eleus*, Drury. The latter has in its constitution much of the blue-green common in this genus which, as Eltringham showed (*African Mimetic Butterflies*, 1910, p. 42) passes easily into the red brown of *Aletis*.

E. eleus eleus is a less perfect mimic than *ruspina* as it still possesses characteristic *Euphaedra* markings on the under surface which are lost in *ruspina*, whose under surface is like the upper; *ruspina* also has succeeded in freeing itself from the blue-green taint. The latter species shows a considerable degree of crenulation of the proximal edge of the black border of the hind-wing which is seen, from *eleus*, to be derived from a row of contiguous black spots. The edge in *eleus* is soft or dyslegnic, and not definitely crenulated.

E. eleus eleus occurs further east than the *Aletis* as it has been taken in Kenya Colony in the Nandi area, while *ruspina* does not seem to extend east of Entebbe in Uganda. But the form *orientalis*, Roths., of *eleus* has been taken at Lindi and Mikindani on the coast of Tanganyika Territory, which suggests that the habitat of *eleus* is more eastern by origin than that of *ruspina*, and that in its western area it has not become stabilised as a mimic of *Aletis*, as has *E. ruspina*. The latter seems to be primarily a W. African species which, like others, has extended its range to Uganda but not beyond, and by its crenulated margin betrays long association with the western *Aletis*. Some of the specimens in the Hope Collection from W. Africa agree with the most western *helcita* in the darker brownish hue.

It is interesting that the crenulation is well shown in the edge of the black hind-wing border of the mimetic Lycaenids, *Telipna sanguinea*, Plötz, and *T. nyanza*, Neave.

Thanks are due to Mr. N. D. Riley, Mr. L. B. Prout, and Dr. Karl Jordan, F.R.S., for kindly helping with geographical data.

The function of the so-called anal gills of the mosquito larva.

Dr. Wigglesworth pointed out that the comparative poverty of the tracheal supply to the anal gills of the larva of *Aedes aegypti*, and the absence of any circulation of blood within them, did not favour the belief that these structures were respiratory organs; that is, "tracheal gills" or "blood gills." This inference was supported by the failure of the flagellate, *Polytoma uvella*, which is a very sensitive indicator of the site of oxygen uptake, to congregate over the surface of the gills when the larva is immersed in a culture of this organism. What, then, was the function of these organs? It was recalled that at an earlier meeting of the Society, evidence was brought forward that the rectal glands of terrestrial insects were concerned in the absorption of water from the rectal contents; and this suggested that perhaps the anal gills of mosquito larvae were also concerned in absorbing water, but from the surrounding medium. Experiments were described which supported this hypothesis. For instance, larvae ligatured round the middle and immersed in hypertonic solutions of glycerine, quickly collapsed behind the ligature but not in front, showing that only the hind end of the larva is permeable to water. And larvae ligatured in such a position that the Malpighian tubes could not discharge their contents into the gut, and then immersed in fresh water, showed great swelling of the distal parts of the Malpighian tubes and progressive distension of the hind part of the body, indicating a continuous absorption of water at the tail end. There was evidence that the larvae feed chiefly on solid particles filtered from the water, and it was suggested that it might be of advantage to the larva to absorb water directly into the blood by means of the anal gills rather than to dilute its digestive juices by swallowing large quantities by the mouth.

A full account of these experiments was published in 1933, *J. Exp. Biol.*, **10**: 16–26.

The scales in *Kricogonia lyside*, Godt.

Dr. F. A. Dixey said:—"There is an interesting little Pierine butterfly, *Kricogonia lyside*, Godt., which occurs from Mexico southwards to Colombia and Venezuela, and in some of the West Indian islands. It appears to occupy an isolated position, having no near affinities. As was seen by the specimens exhibited the wings in the male have a mealy appearance which suggests comparison with the outer border of raised scales found in the males of *Callidryas* and allied genera. On examination of a male specimen of *Kricogonia*, the roughened appearance seems to be most marked at about the centre of the fore-wing, at the giving off of the branches of the median vein. Scales taken from this area are seen to have a characteristic form; they are long in proportion to their width; their sides are nearly parallel, and their distal border is smoothly rounded, showing no indentations. Interspersed with these are a few scales much shorter and broader in outline, with shallow indentations on the distal border. A rough count gives about 98% of the former kind of scale to 2% of the latter. In a sample taken from the apex of the same wing the scales of the former kind still predominate, numbering about 82% of the whole; they are usually somewhat shorter and broader than those from the centre. The scales of the second type,

now about 18%, are indented, but as a rule very slightly so. It would not have been surprising, following the analogy of the *Callidryas* group, if the scales with a rounded border had been found to be absent from the yellow patch at the root of the fore-wing; here, however, they are again present, at this time to the extent of 84%. In this position they are generally larger in both dimensions than those from the centre, and are apt to show a slight lateral curvature such as is occasionally seen in the scent-scales of other groups. The shorter and broader scales making up the remaining 16% have more pronounced indentations than those from the other situations. It is remarkable that the scales with the rounded border, which make up by far the larger group in the male fore-wing, are entirely absent from the female, in which sex the scales appear to be always deeply indented. What the significance of this sex-differentiation may be, can at present only be a matter of conjecture. It would no doubt throw light on the question if the development of the wing in *Kricogonia* could be traced throughout the later pupal stages. An examination of the cells which give rise to the characteristic male scales might give some indication of their function. In such species as *Pieris rapae,* the cells producing the scent-scales are easily distinguishable in the pupal condition. So far as I am aware, no record exists of any scent in *Kricogonia.*"

Recent progress in anti-tsetse work in Africa.

Mr. C. F. M. Swynnerton made remarks on recent progress in anti-tsetse work in Tanganyika Territory and illustrated his remarks with lantern slides.

Papers.

The following papers were read :—

(1) " Hymenopterous parasites of British Lepidoptera," by C. Morley and W. Rait-Smith.

(2) " On an advance of the Tsetse Fly in Central Tanganyika," by C. H. N. Jackson.

Wednesday, October 4th, 1933.

Prof. E. B. Poulton, F.R.S., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—F. B. Notley, c/o Agricultural Department, P.O. Box 338, Nairobi, Kenya Colony; P. H. Simon, 4, Stanmore Hall, Stanmore, Middx.; J. Richardson, 104, Bothwell Street, Glasgow.

Obituary.

The deaths of Messrs. T. A. Coward, E. J. Godfrey, and C. F. Curtis Riley, Fellows of the Society, were announced.

The Hon. Secretary announced that the Council had decided to keep a record of the special interests of Fellows and they were therefore invited to communicate to the Registrar the branches of Entomology in which they were particularly interested.

Exhibits.

A synaposematic Acraeine association from the Budongo forest, Uganda.

Prof. Hale Carpenter exhibited, and made the following remarks upon, a group of Acraeinae sent to the Hope Department by Mr. T. H. E. Jackson, F.R.E.S. Budongo forest lies in Unyoro, between the Nile and Lake Albert, and its interesting fauna is little known. Its western associations are shown by the presence of chimpanzees. Mr. Jackson had collected the specimens at the same time in September, 1932, along a track cut for a sawmill, and wrote: "It is a Müllerian association, isn't it, with, I suppose, *A. jodutta* as dominant and *A. alciope* and *Planema tellus eumelis* as outlying members only; though I have seen worn specimens of the last two of very much the same colouring. *A. alciope* in any case in flight is not as easy to distinguish as it is here in the box." Prof. Carpenter said that his experience of the male of *jodutta* and *alciope* was that they were not always easy to distinguish, and a worn old *tellus* could quite well be mistaken for a male *jodutta*.

A point of great interest in Mr. Jackson's series is that the specimen sent as *P. tellus* is an example of the very rare and little known *Planema schubotzi*, Grunb., of which the only specimen in the National collection is a female, taken by Dr. S. A. Neave also in the Budongo forest. Mr. Jackson's specimen is a male. It seems to combine the features of *epaea epaea*, Cr., and *tellus*, Auriv., having the sub-apical yellow mark on the fore-wing slightly wider than in the former, but narrower than in the latter, and paler orange than the other orange areas; the hind-wing on the other hand has the narrow black margin as in *tellus*. The whiteness of the sub-apical band of the fore-wing, and the golden-yellow suffusion of the apex, together with the uniform ochre-yellow ground of the hind-wing without marginal band give the underside of *schubotzi* a characteristic appearance.

The other specimens sent by Mr. Jackson were :—

(1) *Planema epaea paragea*, Sm., a male with the pale areas rich browny-yellow. (2) *Acraea lycoa media*, Eltr., a male; the form with large and distinct yellowish spots on the fore-wing. The likeness of the male *lycoa* in Uganda to the Uganda form (*paragea*) of *epaea* had been noticed also by Dr. Van Someren and Prof. Carpenter. (3) *Acraea jodutta*, F., a male. (4) *Acraea althoffi*, female form *ochreata*, Eltr., whose likeness to the male *jodutta* was pointed out by Eltringham when describing this form. The interesting mimicry of the male by a female of a species which has another female form mimicking a form of the female of the same model, is worth noting. (5) *Acraea alciope*, Hew., a male.

***Planema epaea*, Cr., from the Sudan–Uganda border, compared with other forms.**

Prof. Hale Carpenter also exhibited two females of *Planema epaea* presented to the Hope Collection by Capt. J. G. Owen of the Sudan Defence Force. They had been captured by Capt. Owen in July 1930 at Lotti on the Acholi mountains along the Sudan–Uganda border east of the Nile, at an elevation of about 3000 ft. One specimen was of the form *homochroa*, Jord., in which the female is orange like the western male, while the other was transitional in appearance between the black and white western type and the brown and cream form *paragea*, Sm., in which the pale areas are contracted in size, found in Uganda. It was of much interest to find these two forms together in an area geographically intermediate between those inhabited

by each. The specimens came from the same locality as those which Prof. Poulton had previously exhibited (1932, *Proc.*, **7** : 5) and show the same interesting linking of the Abyssinian, Uganda, and West African forms of the species.

***Acraea doubledayi rileyi*, Eltr., from the Southern Sudan.**

Prof. Hale Carpenter exhibited three males and a female of the little-known form *rileyi*, described by Eltringham (1913, *Trans. Ent. Soc. Lond.*, **1913** : 409) from specimens in the British Museum from Toma and Errer Gota in Abyssinia and made the following remarks. The four exhibited specimens were captured by Capt. J. G. Owen of the Sudan Defence Force, at Torit, in Mongalla Province, S. Sudan, in April and May 1932. They were extremely interesting as being the first recorded specimens outside Abyssinia, and the more so because the form *sykesi*, E. Sharpe, is not uncommon in S. Sudan and Northern Uganda. A large collection of butterflies from the Nuba Mountains, some eight degrees further north, captured by R. S. Wilson and presented by him to the Hope Department, contained twenty *Acraea doubledayi*, all of the form *sykesi* (1928, *Trans. Ent. Soc. Lond.*, **76** : 46). A collection made by A. L. Kent-Lemon in 1919 in the Southern part of Mongalla province and presented by him to the Hope Department, contained four *sykesi*. Prof. Carpenter had himself taken a few *sykesi* in Northern Uganda, and its range extends as far south as Kisumu on the east coast of L. Victoria and Entebbe on the north coast. There is no doubt that *sykesi* is the least scarce form of this rare species.

The form *rileyi* is thinly scaled and very strongly pink even in the female, the hind-wings being bright rose-coloured even in the specimens captured a year ago.

Gregarious resting habits of Aposematic butterflies.

Prof. Hale Carpenter said that he had been going through a large collection of butterflies from Southern India made by the late J. Williams Hockin and presented to the Hope Department by his widow. Many specimens had Mss. notes attached, two of which were of interest in connection with the accumulation of evidence as to the conspicuousness of aposematic butterflies being accentuated when they went to rest by their habit of gathering together in large associations. Previous remarks on this habit concerning Danaines, Ithomiines, Heliconines, and Acraeines were to be found in *Proc. Ent. Soc. Lond.* as follows : **5** : 48; **6** : 4, 71; **7** : 64.

1. *Papilio hector*, L.

Dr. Karl Jordan, F.R.S., in Seitz's " Rhopalocera of the Indo-Australian region " quotes Euton as saying : " In autumn, at the beginning of the cold season, the butterfly betakes itself at sunset to trees where it spends the night in hundreds together on the underside of hanging twigs towards their tip, as do many Danaids." A Mss. note by Mr. Hockin, attached to a specimen of *hector*, says : " Common on flowers of low shrubs and herbs on roadside in open shady country. Flight leisurely. Roosts in crowds on Babul tree in cold weather."

2. *Cethosia mahratta*, Moore.

A Mss. note by Mr. Hockin attached to a specimen says : " Usually numerous and conspicuous at end of rains in wooded country. Gregarious so that 30 or 40 on one branch." Fruhstorfer (Seitz, *loc. cit.*, p. 4) says the larvae of *Cethosia* are not

unlike those of *Heliconius*; " they are black or brown in colour, marked with yellow belts or with brown rings and yellow bands; as a rule they are gregarious, living together in great numbers, especially during the earlier stages." Of the butterflies Fruhstorfer says: " Among the most gaudily coloured in the Oriental Region. . . . They are attracted by flowers, especially those of *Lantana*, but also frequent low shrubs, resembling in their leisurely stately flight the DANAIDAE." There is thus every reason to presume that these are typical examples of aposematic insects, and this gregarious habit brings them into line with others. It is hoped that these remarks may evoke some observations on the relative edibility of *Cethosia*.

Winged ants as food for gulls.

Prof. HALE CARPENTER also exhibited a winged male and female of the ant *Acanthomyops flavus*, L., which Mr. Donisthorpe had kindly identified. He said that when at the Bedruthan steps near Newquay on August 3rd, he noticed Herring Gulls congregated at certain spots not only catching things in the air but picking them up off the grass. Investigation showed that the winged adults of *A. flavus* were swarming at those spots, and the gulls, both mature and young in grey plumage, were wandering about over the grass and picking up the ants.

***Callimorpha dominula*, ab. *bimacula*, Cockayne.**

Prof. HALE CARPENTER also exhibited, on behalf of Mr. J. Collins of the Hope Department, a pair of *C. dominula* taken by Mr. Collins *in copula* at Cothill near Oxford on July 9th, 1933. The female was of the form described as *bimacula* by Dr. Cockayne in 1928, *Ent. Rec.*, **40** : 154, Pl. VII, fig. 8. The spots on the fore-wing, except the two basal ones, were black, the basal spots being yellow: the hind-wings more heavily marked with black. The form was described as a homozygous recessive and apparently has not been found elsewhere than at Cothill. The male specimen of the pair was normally marked.

A reputed British specimen of *Argynnis* (*Brenthis*) *dia*, L.

Prof. HALE CARPENTER also exhibited a specimen of *Argynnis* (*Brenthis*) *dia*, L., from the collection of the late Mr. Norman Somerville Brodie, presented by Mrs. Brodie to the University of Oxford. The label on the specimen, in Mr. Brodie's handwriting, bore the data " near Christchurch, 27.7.87.", but it is not known who captured the specimen.

Commander J. J. Walker, R.N., had kindly given a reference to an account of an undoubted British specimen captured in September 1837 at Cookham Deane, near Maidenhead, and identified by Doubleday (1857, *Ent. Wkly. Intellig.*, **3**).

A rare moth, *Odezia tibiale*, Esp.

The Rev. E. B. ASHBY exhibited a female of this moth caught by Dr. Scott of Ashford, Kent, at Mouhijärvi, S. Finland, on 4th July, 1933, and pointed out that the only European example in the British Museum collection is labelled " Piedmont."

He also exhibited a series of the Noctuid, *Ochria aurago*, taken by Dr. Scott and himself in the neighbourhood of Ashford, Kent, in September 1933, showing some degree of variation.

A beetle new to Britain.

Mr. Donisthorpe exhibited a specimen of the Clerid, *Denops albofasciatus*, Charp., which had not been recorded from Britain before. It was found by Miss Irene Kirk on the window-sill in his study on 26th August, 1933. On the continent it occurs in the wood of old vines in the burrows of the Bostrychid, *Xylonites retusus*, Ol., a genus not found in Britain. He suggested that it was possibly parasitic on other wood-boring beetles, and that it may have come from *Lyctus brunneus*, Steph., which was rather common in a table which had been in the room a little over a year previously, or *Anobium striatum*, Ol., which is abundant in the woodwork of the stairs and roof leading down into the cellar. Further there were many oak logs in the cellar and sticks in the garden brought from Windsor Forest, and the fence on one side consists of oak from Windsor Great Park. Both *Lyctus linearis*, Goez., and *L. brunneus*, Steph., occur on these fences at Windsor.

European species of *Monochamus* in Britain.

Dr. K. G. Blair exhibited specimens of the four European species of the genus *Monochamus*, Latr., that have occasionally been taken in Britain, and in great part erroneously recorded, viz.—*M. quadrimaculatus*, Mots., *M. sartor*, F., *M. sutor*, L., and *M. galloprovincialis*, Oliv., and pointed out their differences.

An exotic Lepidopterous Larva from Kew Gardens.

Mr. N. D. Riley exhibited a caterpillar of a Noctuid moth belonging to the genus *Brithys*, and probably referable to *B. pancratii*, Cyr., or *B. crini*, Fab., which had been found in company with a number of others in Kew Gardens. The former species is Mediterranean and African in its distribution, the latter purely Oriental, but a decision could not be reached as to the identity of the actual caterpillar exhibited owing to the great similarity between those of the two species. It appeared that no species of the genus *Brithys* had hitherto been met with in the British Isles, and it was thought that the larvae had probably been imported with plants, although *Zephyranthes candida*, upon which they were found feeding, is a S. American species that has been long established at Kew.

Insects, etc., taken at The North Cape 27–28 July, 1933.

The President said that he had paid a short visit from about 11.0 p.m. to 1.30 a.m. to this interesting locality—the most northern point of Europe. The summit of about 1000 ft. was reached by a steep path winding up a ravine to a height of about 500 ft., and then by a rather rough walk of about 2 miles over a stony plateau rising gradually to the top. The amount and luxuriance of the herbaceous vegetation in the ravine was a surprise. Nearly all the following specimens, taken by himself unless otherwise stated, were exhibited to the meeting. The Empid fly *Hilara femorella* and the Carabid beetle *Leistus ferrugineus* were captured a little above sea-level by his young friends Paulette and Arlette Fumaroli, respectively.

Coleoptera—all under stones, principally on the plateau. The weevil *Otiorrhynchus arcticus*, F.—7, and the abdomina of 11 others; the Elaterid *Hypnoides rivularis*, Gyll.—2; the Carabids *Patrobus assimilis*, Chd., and *Leistus ferrugineus*, L., ♂.

Diptera and Hymenoptera—the Empidids *Hilara femorella*, Ztt., ♀, and *Rhamphomyia sulcata*, Fall., ♀, in a flower; as also a ♂ Ichneumonid, Ophioninae (Camptoplegini): both the latter taken by a friend on the plateau.

Lepidoptera—a Geometrid moth, *Entephria caesiata norvegica*, Strand, female, was captured flying about 11.30 p.m. in the ravine, also a male in the same locality, by Mr. P. G. Luck. The female laid many fertile eggs and the larvae, some of which were exhibited, took to sallow. Most of them, however, grew but little and were apparently hibernating, although a small proportion continued to feed and were nearly mature.*

Arachnida—a species of *Phalangium* was often found under the stones, while other specimens were taken walking on the ravine path about 1.0 a.m. They appeared to be the only predacious species likely to have attacked the weevils, and if this conclusion is correct, it may be suggested that the food was rendered available by the injection and re-absorption of a solvent fluid.

He owed the determinations to his kind friends, Maj. E. E. Austen, Dr. K. G. Blair, Dr. F. W. Edwards, Dr. C. Ferrière, Mr. L. B. Prout and Mr. W. H. T. Tams.

An Insect Trap.

Dr. R. Malaise, a visitor, described and illustrated on the epidiascope a trap designed for catching insects.

The Hon. Secretary communicated the following which had been received from Dr. W. L. McAtee.

Rejoinder to papers on Protective Adaptations recently published by the Entomological Society of London.

The papers are replied to *seriatim* and a general statement of my position is given at the end.

Jones, Frank Morton, Insect Coloration and the Relative Acceptability of Insects to Birds, 1932, Trans. Ent. Soc. Lond., 80 : 345–385, pls. 18–28.

These experiments performed at Martha's Vineyard, Mass., can be checked in part with the results of analysis of the contents of collected stomachs of nearctic birds. The experimenter offered insects in number and variety to wild birds thus eliminating some of the artificialities that have characterised experiments with captive birds. The experimenter also, it may thankfully be recorded, did not indulge in the usual comment on supposed manifestations of disgust and the like. Nevertheless, two decided abnormalities characterise the tests: (1) The insects were dead (so far as we know such insects form an exceedingly small proportion of the food of wild birds), and (2) the numbers of adult Lepidoptera offered to the birds were greatly out of proportion to the other insects used (in view of the natural food habits of the birds concerned, none of which feed upon these insects to an extent of as much as 2 per cent. of their total diet). As a matter of fact none of the 8 species which Dr. Jones lists as contributing most to his records is a preponderantly insectivorous species. There is, moreover, no getting away from the fact that

* Two of these have since pupated and emerged.—E.B.P., 9 Nov., 1933.

selection of food items in experiments always is to some degree that of the experimenter.

The results are summarised in tables based on the numerical evidence of comparative acceptability of the insects under the conditions of the experiments. On "acceptability ratings" the insects offered are classified in three groups, namely, (I) those with ratings between 60 and 100, (II) those with a range of from 25 to 60 (26–59?), and (III) those with 25 or lower.

Omitting all Lepidoptera, for the reason previously mentioned, and further because identification of these insects to species is so seldom carried out in the case of imagos found in bird stomachs that there is little basis for comparison, the writer submits the following lists corresponding to Jones' tables of acceptability ratings. They show the number of identifications of the insects concerned made in the course of stomach analysis of nearctic birds in the Biological Survey. Lest some sharp-eyed individual make the mistake of supposing these figures should correspond with any given in my Smithsonian paper,* it should be noted that these records are taken from our index as it now stands, *i.e.* additional data may have been incorporated.

Section I: Those with ratings 60–100.

Name.	*Number of Records.*	*Name.*	*Number of Records.*
Coleoptera.		SCARABAEIDAE—*Continued.*	
TENEBRIONIDAE.		*Phyllophaga fusca*	140
Tenebrio obscurus	1	,, *forsteri*	9
SCARABAEIDAE.		,, *crenulata*	14
Serica sericea	5	*Polyphylla variolosa*	0
Diplotaxis sordida	1	*Dichelonyx elongata*	27
Phyllophaga gracilis	1	*Ligyrodes relictus*	22

Summary Section I. The number of records varies from 0 to 140, the total is 220, and the *average number of records per species is* 22.

Section II: Those with ratings 25–60.

Name.	*Number of Records.*	*Name.*	*Number of Records.*
Coleoptera.		CERAMBYCIDAE.	
CARABIDAE.		*Derobrachus brunneus*	3
Harpalus pennsylvanicus	169	*Hypermallus parallelus*	3
SILPHIDAE.		*Judolia cordifera*	3
Silpha surinamensis	16	*Cyllene robiniae*	2
CANTHARIDAE.		CURCULIONIDAE.	
Cantharis rotundicollis	3	*Brachyrhinus sulcatus*	20
ELATERIDAE.		Hemiptera.	
Melanotus fissilis	9	PENTATOMIDAE.	
ALLECULIDAE.		*Acrosternum hilare*	88
Capnochroa fuliginosa	1		
SCARABAEIDAE.			
Serica georgiana	0		
Macrodactylus subspinosus	47		

* McAtee, W. L., 1932, *Smithson. Misc. Coll.*, **85**, (7): 1–201.

Summary Section II. The number of records varies from 0 to 169, the total is 364, and the *average number of records per species is* 28.

Section III: Those with ratings 0–25.

Name.	*Number of Records.*
Coleoptera.	
CARABIDAE.	
Harpalus caliginosus	276
SILPHIDAE.	
Necrophorus americanus	2
,, *orbicollis*	2
,, *pustulatus*	5
LYCIDAE.	
Calopteron reticulatum	0
LAMPYRIDAE.	
Photinus consanguinius	0
Photuris pennsylvanica	5
CANTHARIDAE.	
Chauliognathus pennsylvanicus	53
OEDEMERIDAE.	
Nacerdes melanura	1
MELOIDAE.	
Epicauta marginata	1
,, *pennsylvanica*	12
COCCINELLIDAE.	
Epilachna borealis	0
SCARABAEIDAE.	
Trox unistriatus	0
CERAMBYCIDAE.	
Tetraopes tetraophthalmus	2
CHRYSOMELIDAE.	
Crioceris duodecimpunctata	0
Labidomera clivicollis	2
Chrysochus auratus	2
Trirhabda canadensis	3
Hemiptera.	
LYGAEIDAE.	
Lygaeus kalmii	9
Neuroptera.	
CHRYSOPIDAE.	
Chrysopa sp.	51
Hymenoptera.	
ICHNEUMONIDAE.	
Ophion sp.	60
VESPIDAE.	
Polistes pallipes	5
Vespa diabolica	1
,, *maculata*	18
BOMBIDAE.	
Bombus sp.	48
APIDAE.	
Apis mellifica	128

Summary Section III. The number of records varies from 0 to 276, the total is 696, and the *average number of records per species is* 26·76.

It would appear from these tabulations that so far as revealed by analysis of naturally taken food of nearctic birds the differences in frequency of capture of the three groups of insects are not significant.*

Dr. Jones seems to think that his results with *Tetraopes* are of particular weight and implies that the 9 records cited for that genus in my Smithsonian paper are below due proportion. This may be, but our material was neither infinite in quantity nor perfectly distributed (as to space and time), so that not too much reliance can be placed on details. It often occurred to me as I conned the tabulations that, all things considered, a single record of a given species might be as much as could be expected. Due to rarity or obscurity, there are doubtless many which we may never identify from bird stomachs. Not that some species of *Tetraopes* have either of these qualifications; the meaning is rather that not too much emphasis need be placed on details of a body of data, admittedly far from perfect.

* The essential basis for such comparisons is identification, and I should like to explain here that probably half of the entire number of stomachs examined were not analysed in such detail as we have endeavoured to carry out in more recent years. Had this been done, the numbers of identifications for many species would be materially larger. It should be stated also that all stomach contents are preserved after study, that our files of stomach analyses, indexes thereto, and in fact our whole equipment are always available for consultation.

Dr. Jones seems to put great stress also on the apparent discrimination by birds in preying upon drone rather than worker hive bees. I do not question the visual acuity of birds, but I consider that the preponderance of drones among honey-bee captures (49 to 27 in the cases where sex is recorded on our index cards) is much more easily explainable by the usual slower and clumsier flight of the drones.

As food for thought in connection with these experiments in which dead insects were used, I suggest "Some Experiments on Protective Coloration," * by R. T. Young, from which it was concluded that "Stillness is probably a more important factor than color in protecting animals from their foes" (p. 499). Contrastingly coloured insects are mostly in the class with the lowest acceptability rating in Dr. Jones' tables, while in Young's where contrast with background was tested, "in only five cases out of the forty-eight, did a bird pass over a conspicuous combination in favour of an inconspicuous one" (p. 497).

With reference to quotations from Professor F. E. L. Beal, see my remarks toward the end of this paper.

On the whole the account of his experiments by Dr. Jones as well as his arguments are more reasonable than has been the case with various other experimenters, but that experiments involving unnatural factors, as all of them do, are "trustworthy guides to behaviour under natural conditions" remains contrary to the evidence and in general unbelievable.

Again, as in 1912, I ask why perform experiments when they can never yield reliable information on the point at issue—natural choice of food? Why not instead accept the evidence supplied by analysis of the contents of stomachs collected under natural conditions?

Discussion. Protective adaptations of animals—especially insects. 1932 (1933), Proc. Ent. Soc. Lond., 7 : 79–105, figs. 1–2.

Prof. E. B. Poulton, pp. 80–86, figs. 1–2.

Reply to the "paper read before the Fifth International Entomological Congress in Paris last July, to be published in its Proceedings," which alleges my views to be "unsound" cannot of course be made at this time.

Prof. Poulton calls attention to the gregariousness of certain conspicuously coloured insects which seem to be unmolested and remarks, "How different would be the fate of procryptically coloured insects crowded in a small area, a difference which" he considers proved by certain experimental results. Even the presently cited experiments prove too much as all of the insects concerned were covered by cloth bags. If the birds pecked into some and devoured the contents and ignored others, it would appear that some quality other than colour gives the "protection" and that unusual coloration would therefore be unnecessary to their defence.

Going to natural occurrences and ignoring experiments which seem of little value in this field, it should be obvious to any experienced entomologist that procryptically coloured insects often do crowd together in small areas. I have seen grey Psocids in patches on tree-trunks and have observed as an annual occurrence plainly coloured mayflies perched on bushes along streams until they bent the branches like those of orchard trees heavily laden with fruit. The inconspicuous

* 1916, *J. Exp. Zool.*, **20** : 457–499.

Chironomids congregate in the same way, but with less effect due to their small size. Dull coloured *Hoplia* assemble so as to cover flower-heads. The greyish *Atherix* at egg-laying time aggregates in masses on branches pendent over streams. The Sciarid larvae forming a rope or " Heerwurm " become conspicuous only by reason of their massed numbers. Swarms of Chironomids simulate clouds of smoke and attract public notice, but the insects certainly are procryptically coloured. So are the winter crane-flies (*Trichocera*) which dance in hundreds in the sun. It would not be difficult to multiply instances of inconspicuously coloured insects assembling in great numbers, and it is certain that they do so, without thereby endangering the existence of their kind.

I am charged with ignorance of the nocturnal activity of Geometrid larvae, but I must say that if these larvae were not more or less active by day " inch worms " or " measuring worms " would not be known to children universally as they are. Mr. J. R. Malloch who collected and bred Geometrids among other insects in Scotland for years kindly permits me to record his observation that Geometrid larvae are by no means exclusively nocturnal in their movements. Despite " protective " qualifications, Geometrids are in the same position as other groups containing numerous species. Some are rare, some are common. The common ones most certainly are freely eaten by birds, as for instance the cankerworms.

Forbes collected representatives of 36 species of birds in an Illinois orchard and by stomach analysis found that 26 (or 72 per cent.) of the species had eaten cankerworms. Thirty-five per cent. of the total bulk of the food of all the birds consisted of these larvae.* Wellhouse says, " Probably no insect is a favorite food of more species of birds than the cankerworm larva." He reports on an examination, by C. D. Bunker, of 100 stomachs representing 39 species of birds collected in a grove in Kansas. All but three of the species had eaten cankerworms and 18 of them had at least one individual which had eaten 100 per cent. cankerworms.†

As noted in the section devoted to Dr. Jones' paper, discussion of references to Prof. Beal's papers will be given later.

Dr. R. A. Fisher, pp. 87–89.

There is a temptation to reply to critics in kind, but in this case I shall ignore it. Among other pedantries, Dr. Fisher restates the selectionist theory of protective adaptations as if all parties to the discussion did not know it by rote. Part of this statement unfortunately must be quoted here introductory to comment. " The theory," Dr. Fisher says, " throws no light upon whether the depredations are less intense, equally intense, or more intense, than they have been in the past; but it does imply that the mortality of less perfectly adapted individuals has in the past been higher than that of more perfectly adapted individuals of the same species. And this, if generally true, should be true at least of the many species at the present time. McAtee's data throw absolutely no light upon this question " (p. 87).

The theory implies selective mortality but its supporters have done little in the way of presenting evidence backing up that implication. Who is there, moreover, that can pronounce as to relative values among slightly varying degrees of supposedly protective adaptations? In the absence of such data what evidence has been

* 1883, *Bull. Ill. State Lab. Nat. Hist.*, **1** (6), 32 pp.
† 1917, *Bull. Univ. Kansas*, **18** : 301–302.

offered, or what can be offered, that the mortality of less perfectly adapted individuals is higher than that of more perfectly adapted individuals? The treatment of the subject has been highly speculative, so why blame McAtee for throwing no light upon the question? McAtee did at least present a mass of data which built up a fair presumption of practical indiscriminacy among predators and indicated almost total indiscriminacy of all natural checks combined with respect to protective adaptations. Guided by these deductions from data fairly adequate as to quantity, it seems much more reasonable to doubt selective elimination with respect to degrees of perfection of protective adaptations than to believe in it merely because the idea has been embodied in long-standing theory.

The whole range of selection problems cannot be covered in a single paper, and mine gave no special attention to mimicry. It may be pointed out, however, that selectionists are in no position to prove the value of slight modifications tending toward more perfect mimicry. They only assume such a value because it is a necessity to their theory. If fate permits, I may some day go into the mimicry situation more fully. Just now it is sufficient to indicate that selectionists utterly ignore the mimicry of organisms that do not now inhabit, and so far as we can tell never have inhabited, the same area. A profusion of such cases can be found under discussions of "adaptive radiation," and there are numerous instances also that usually escape mention in that connection. The explanation of them cannot be that embodied in the mimicry theory, but their existence relieves the student from any compulsion toward acceptance of that theory.

Dr. Fisher cavils at my use of such words as "approximately," "practically," and the like. In explanation, I may say that I have been taught, and continue to believe, that employment of such "saving" words is the mark of a scientist. The biologist certainly should adhere to this precept, for organisms are so variable in structure, in responses, in their every quality, variable not only here and now, but also in relation to space and time, that the making of positive assertions and especially of attempting to cramp generalities about them into exact mathematical form, generally is ill-advised.

"Let us ask," says Dr. Fisher, "how largely predators must be guided in the choice of food by availability so as practically to ignore protective adaptations. I do not know within a million-fold, nor does Dr. McAtee" (p. 88). McAtee repeats, however, that the degree to which they were shown in his Smithsonian paper to ignore protective adaptations creates a presumption of indiscriminate tendencies. Surely this even with "saving" words is something more satisfactory than merely theoretical claims as to selective advantages.

Dr. Fisher as a mathematician is "provoked or even exasperated" by McAtee's use of figures and cavils at them from various points of view. Briefly let me remark that four decimal places were used because in many instances the figure recorded is ·0001. Dr. Fisher is quick to criticise the table on Lepidoptera for which correction was given in an errata sheet, but he does not have the grace to say that all of the others total about 99·99 as all good percentage tabulations should. I explained in my Smithsonian paper for the benefit of all who *would* read (apparently a small proportion) that the percentages of species described in various groups was used as the only available indication "giving a fair working idea" of relative abundance for all the groups concerned. Dr. Jones, writer of the first paper here commented

upon, was able to appreciate the tentative nature of these comparisons even if Dr. Fisher cannot. I was merely seeking for some standard that might help those unexperienced in the study of animal food habits to realise the principle that all classes of food available to organisms are utilised. All of the percentages relating to the number of species in animal groups can be entirely removed from my paper without affecting the demonstration that it undoubtedly furnishes of the amazing distribution of predatory attack. That such attack tends to be guided by numerical availability is, moreover, independently indicated by the data quoted from Needham (p. 138) and Weiss (pp. 140–141).

Dr. Fisher further says, " Yet McAtee really seems to believe that if he can show that predatism is influenced by availability, even without any attempt at a quantitative measure of the magnitude of this influence, it will follow that visibility and feeding preferences have no effects " (p. 89). I must remark that I presented the quantitative data accessible at the time. Selectionists in 75 years have not done anything comparable. The whole of my paper was about feeding preferences, while the bulk of attempted selectionist contributions to this subject have been utterly unreliable experiments. Visibility is a phenomenon possibly different for every type of predator or other natural enemy involved, and is in each case an innate quality which we can scarcely hope to understand or evaluate.

Again from Dr. Fisher we hear that " The fallacy that selection on the adult would be ' swamped ' by a sufficiently high and statistically independent death rate at earlier stages, was accepted by Wallace, but will not bear critical examination " (p. 89). There are cases in which " selection " (which merely means death before reproduction) seems to be entirely confined to immature stages (see Salisbury, May 31, 1930, *Nature*, **125 :** 817). In others the effect is so nearly the same that the opportunity for " selection " among adults is very small. The scope for selection (if it really occurs) is so restricted in various directions that the burden put upon it, as other writers besides myself have pointed out, seems too great to be successfully borne.

Sir Guy Marshall, pp. 89–90.

Some strong language occurs here : " negative evidence against mimicry has no value whatever if it is collected in an area in which mimicry does not occur " (p. 89). Opinions differ of course as to what constitutes ant mimicry, but if we take the term as meaning merely ant resemblance, then it certainly does occur in the nearctic region. In evidence may be cited the nymphs of Alydinae, certain small Carabids, such Cerambycidae as *Euderces* and *Cyrtophorus*, various Anthicidae, the Diptera, *Myrmecothea*, *Cyrtometopa*, *Steneratina*, *Sepsisoma*, *Sepsis*, *Calobata*, numerous Bethylidae, Gelinae, and Mutillidae, and spiders of the genera *Myrmarachne*, *Peckhamia*, *Synemosyna*, *Tutelina*, *Castianeira*, and *Micaria*.* Be it remembered, however, that my paper did not go into details of the mimicry problem. It merely pointed out that the intensity of predatory attack on ants renders the theories of any mimicry highly incredible. Marshall also says, " McAtee tacitly assumes that all ants are supposed to be protected from attack, an assumption that is entirely without warrant " (p. 90).

* The spiders cited as ant mimics by Banks, N., 1907 (1908), *Proc. Ent. Soc. Wash.*, **9 :** 9.

McAtee is really glad to have this admission but wonders whether the other selectionists will abide by it. He did not feel that he was making assumptions, rather that he was stating the selectionists' case in their own words. For instance Poulton says, " Ants . . . are known to be aggressive dominant insects avoided by the majority of insect-eating animals, although certain species are adapted to feed almost exclusively upon them," and he refers to " The numerous mimetic resemblances to the aggressive, abundant, and well-defended ants . . ." *

Marshall asserts, " But none of the dominant and aggressive species occurs in North America, where the great majority of the ants are timid and unaggressive " (p. 90).† He refers to *Eciton* of Tropical America and formidable ants of other lands, but it was surely none of these that Donisthorpe had in mind when he wrote of *Nabis lativentris*, a British myrmecophilous insect, " I consider this insect to be an ant mimic in its earlier stages. . . . From this mimicry it obtains protection from outside enemies, both as much when away from ants as when with them." ‡ If we must go to the tropics, however, to the tropics we will go, meanwhile cautioning Marshall that while it is good tactics to retire under fire to a more easily defended position, it is the part of prudence to ascertain in advance whether the new position is really more capable of defence.

In a collection of bird stomachs § from Panama, representing 216 species, ants (including those of the genus *Eciton*) were found in stomachs of 114 species, most frequently in those of Trochilidae, Dendrocolaptidae, Formicariidae, Hirundinidae, and Mniotiltidae. In a collection § from Porto Rico, comprising 62 species, ants had been eaten by 50 of the species, most commonly by the honeycreeper, grackle, woodpecker, killdeer, cliff-swallow, ovenbird, and tody. In India of 109 species examined, 50 had eaten ants and the scientists who did the work comment that, " The ants, like the grasshoppers, are exceedingly abundant insects and form a very large proportion of the insect food of birds in India. They are perhaps the favourite food of the Woodpeckers, Wrynecks, Rollers, and some of the Pheasants. Most birds that eat insects of any kind will almost certainly be found to take ants of one species or another." ||

Bequaert has written on " The predaceous enemies of ants " ¶ and records among other things that Cleland found 73 species of Australian birds to eat ants (including *Myrmecia*) and that Chapin found 85 or more species of Congo birds to prey upon ants (including *Dorylus*).

The principles of predation are the same everywhere, as is well shown by Weiss's results quoted in the Smithsonian paper (pp. 140–141); and it does no good to shift to peradventure unknown climes in the hope of obscuring the issue. Where there are more ants there will be more ant enemies. This principle is just as certain as that soil will be occupied in proportion to its capacity for supporting plants.

* 1908, *Essays on Evolution*, pp. 281, 252.

† As a matter of fact such redoubtable stingers as *Pogonomyrmex* and *Solenopsis* occur, and are eaten by many birds.

‡ 1921, *Ent. Mon. Mag.*, **57** : 137–138.

§ Contents analysed by Alexander Wetmore.

|| Mason, C. W., and H. Maxwell-Lefroy, 1912, *Mem. Dept. Agric. India*, **3** : 331.

¶ 1922, *Bull. Amer. Mus. Nat. Hist.*, **45** : 271–331, pl. 1.

Mr. H. St. J. K. Donisthorpe, p. 90.

Mr. Donisthorpe says he has no evidence of birds capturing worker ants, but in his book on British Ants (1927, p. 298) he quotes the eminent myrmecologist Wasmann to the effect that he found in Holland near *Formica rufa* nests " fifty droppings of the Green Woodpecker, containing no less than ten thousand *rufa* workers."

As to ant-eating species of British birds, Dr. Walter E. Collinge of the Yorkshire Museum, who should be consulted by those in need of information on the food habits of birds, tells me (letter of July 31, 1933) that his list includes the goldfinch, chaffinch, corn-bunting, skylark, pied flycatcher, mistle-thrush, song-thrush, blackbird, wheatear, robin, hedge-accentor, swallow, hoopoe, green woodpecker, great spotted woodpecker, lesser spotted woodpecker, wryneck, golden plover, pheasant, common partridge, red-legged partridge, and red grouse.

Mrs. C. B. S. Hodson, p. 90.

Refers to experiments reported on in the Report of the 68th Meeting of the British Association for the Advancement of Science, 1898 (1899), pp. 906–909; the conclusions that mortality may be great in the pupal stages of Lepidoptera, that sight is important to enemies in discovering the pupae, and that conspicuously exposed specimens were most freely preyed upon offer nothing that is opposed to the arguments of my paper.

Mrs. M. D. Brindley, pp. 91–94.

" The view that the most abundant species have the most numerous enemies is not in itself very revolutionary " (p. 91) is the opening statement in this section. The premise is revolutionary, however, in its logical extension of predation being proportional to population. If that view or any approximation to it had characterised selectionist writings, my Smithsonian paper would not have been prepared. Instead we read of " selective advantage " and of the " preservation of favored races."

Mrs. Brindley further says, " I do not feel convinced that this last [number of species in a group] is necessarily a fair index of the absolute abundance in individuals of the group in nature " (p. 91). McAtee never asserted that it was more than a crude sort of index. The subject is more fully discussed in the R. A. Fisher section.

It would not seem essential in a reply like the present to point out all dubious statements even when irrelevant, but one can not but marvel at the uncritical attitude that prevails. Quoting Wheeler's statement that ants " outnumber all other terrestrial animals " * is an instance in point. This statement could not have been made with either soil protozoans or nematodes in view, and it is doubtful whether it could be sustained even if it read " insects " instead of " animals." Chironomids if allowed as " terrestrial," certainly can be urged at least as rivals of ants in numerical abundance. This does not take into consideration combined numbers of all groups of terrestrial animals which apparently is the inclusiveness of the original statement.

The difficulty in identification of bird-food items referred to by Mrs. Brindley

* " They outnumber in individuals all other terrestrial animals." Wheeler, W. M., 1913, *Ants, their structure, development, and behaviour*, p. 2.

was not to orders of course but to subordinate groups, especially species in certain cases. It is, moreover, impracticable, as I pointed out in the Smithsonian contribution as well as elsewhere in the present paper, to detail in print the identifications that were made, amounting, as I said, to a thousand typewritten pages. The general impression of universal liability to capture should forestall doubts because of lack of mention of certain definite groups in a necessarily generalised discussion. Another point to be borne in mind is that the evidence as to widespread predation never decreases but steadily increases, and with analyses of stomach contents representing different birds, seasons, and regions, and reflecting also local conditions as they vary from year to year, the total number of species of prey identified, as well as the number of records for previously identified forms continues to mount. Such results tend to balance apparent inequalities in the tables I presented based on 80,000 stomach examinations. If similar data on 800,000 stomachs could ever be assembled, the showing for indiscriminacy of predation would certainly be greatly increased.

Criticism in the leading paragraph on page 92 in part refers to the impossibility previously explained of presenting details in my paper. These details may largely be found in separate publications of the Biological Survey on the food of birds, which some of my critics have cited in other connections (pp. 86, 100–102, 104). My censors do not seem to be aware of the fact that some of their asseverations are very elementary. Surely some credit should be given to an organisation that has been studying the food of birds for 47 years for being acquainted with the more obvious details of the subject. Stress on the knowledge of field ornithologists is beside the mark. All Biological Survey food analysts have also been field ornithologists, and a general summation of the work done on food habits of birds would show that somewhere near half of it has been field investigation. "Birds do not all eat the same things" (p. 92) is a platitude which to say the least can scarcely be considered as an argument against my thesis of predation tending to be proportional to population. "Misleading unless regular samples of the birds were taken from the same area throughout the year" (p. 92) is another uncalled-for remark. A principle that has always been followed so far as practicable by the Biological Survey is that formal reports on the food of birds should be based on material adequate in number and well distributed both seasonally and geographically.

The statement that "the Song Thrush is the only bird known to take the snails *Helix aspersa* and *H. nemoralis*" (p. 92) is one which a food habits student would not make because experience has taught him that no such restricted predation is probable. In this case Dr. Collinge again kindly informs me that both of the species of snail named are taken by the jackdaw, jay, song-thrush, missel-thrush, redwing, and blackbird, and *H. nemoralis* also by the starling and cuckoo. Similarly Mrs. Haviland's list of birds (3) preying upon *Bombus* must be extended to six upon the basis of Dr. Collinge's records. The species are great tit, blue tit, red-backed shrike, spotted flycatcher, pied flycatcher, and wheatear.

The paragraph on birds as ant enemies contains five errors of statement as to what I have said. The remarks of the reviewer on *Pogonomyrmex* fail to take into account the fact that this genus of ants is found only in the extreme south-western United States, and naturally would not be represented in our records so often as other more generally distributed forms. Up to the date of publication of that paper, moreover, we had examined relatively few bird stomachs from the arid south-

west. Data additional to that given in my paper are that in 84 stomachs of Gambel's quail taken in spring and summer months in Arizona 18 contained *Pogonomyrmex* in numbers from 1 to 23, these ants constituting 6 per cent. of the total contents of the stomachs in which they occurred. The records for *Pogonomyrmex* quoted by Mrs. Brindley are 25 birds, 66 records; they now stand 29 birds, 90 records. So it goes in food habit studies.

There does not seem to be any point in going through all the comment on my tables. Rightly viewed, they show that almost any group of prey tends to have special enemies, sporadic enemies, and foes of intermediate rank. All of these classes of foes vary from group to group, and the combined effect as I urged tends toward indiscriminacy.

H. B. Cott, pp. 94–96.

This writer here as elsewhere shows a tendency to read his own meaning into my words and then criticise it. He says that " McAtee neither gives us the number of captures, nor does he show that the numbers which he does give bear any relation to the abundance of food-animals in nature." My paper certainly does give the number of captures in the sense that I used the term, but not the number of individuals taken for the reason cited on page 7. Percentages of the food by bulk were not part of the calculations of the Smithsonian paper; they may be found in the Bulletins of the Biological Survey on numerous groups of birds. Since no one now or ever can put in figures the " abundance of all food-animals in nature " it would seem that harping upon this point is gratuitous. In the single restricted case where it could be done (Needham on fish food, p. 138), the tendency for predation to be proportional to population was evident. The general purport of all the evidence to the effect that food is utilised more or less in proportion to its availability should forestall demands for proof in specific cases. The selection theory certainly has been accepted upon much more uncertain grounds.

Cott here and elsewhere has given data on the food of certain species and said that this does not look like proportional predation. It should be realised in such connections that McAtee has never said or implied that predation by single species is in proportion to population. He only concluded from entirely adequate evidence that predation by all nearctic birds together " tends to be in proportion to population," and that " the combined attack of birds plus all other predators still more closely approaches complete indiscriminacy " (p. 144).

Before committing themselves too far in opposition to the principle of proportional predation, selectionists should reflect on the extent to which it has been relied upon in their own arguments, particularly as to warning colours and mimicry. Thus Darwin says (paraphrasing Bates), " The mockers are almost invariably rare insects; the mocked in almost every case abounds in swarms " (*Origin of Species*, 6th Ed., p. 416). Wallace says of the participants in Müllerian mimicry, " They derive mutual benefit . . . but when one of the species is scarce or verging on extinction, the benefit becomes exceedingly great, being in fact exactly apportioned to the need of the species " (*Darwinism*, 1896, p. 256). Meldola also writing of Müllerian mimicry states that " the loss in individuals incurred by each mimetic species becomes proportionally more and more diminished, the larger the number of individuals over which the loss is distributed " (1899, *Nature*, **60 :** 56).

Experiments and observations on the young purple martin (*Progne purpurea*, L.) conducted near Milwaukee, Wis., U.S.A., by Miss E. A. Oehlenschlaeger, pp. 98–100.

Nestling martins fallen from their boxes were fed merely in an attempt to rear them. There was no experimentation, and the identifications of the insects concerned appear to have no scientific validity. Interpreters make much in this case of rejections of certain food items by the young birds which selectionists assure us must learn by experience what is good or not good to eat. As the birds concerned probably had no experience with the insects offered, their preference must be explained on other grounds; what this is may be left to the imaginative.

Evidence of the effectiveness in Nature of the Protective Adaptations in some insects as illustrated by the Food-habits of certain Nearctic Birds, pp. 100–104.

No doubt it gave the communicant a thrill thus to use my title in reverse, but if his satisfaction were in proportion to the impartiality of his " evidence," it would be short-lived. Selectionists long have pointedly ignored the results of ornithological food habits research in the United States but now seeking comfort from stray crumbs of it provide a laughable spectacle. All of the excerpts cited from Biological Survey bulletins are based on data which was incorporated in the grand assemblage upon which my Smithsonian paper was based. The whole is greater than any of its parts.

We do not require the services of selectionists in pointing out that certain birds or groups of birds exhibit food preferences. That is a fundamental. Consider ospreys in relation to fishes, auklets to amphipods, cuckoos to caterpillars, woodpeckers to ants, etc., etc. All of this, however, only goes to show that probably no food resource remains unexploited and that there is an inevitable tendency for predation to be in proportion to population. The more inclusive the survey of predators, the more the principle is exemplified.

Those who believe that they can quote the late Professor Beal, the world's most experienced economic ornithologist, in opposition to this principle are deluded, for in the *Yearbook of the United States Department of Agriculture* for 1908 * he specifically adheres to it, saying " If all species of insectivorous birds be considered as a whole, it is found that they eat insects of the various species in about the proportions in which these species exist in nature " (p. 346).

Conclusion.

After all these pages, the writer must confess that it seems futile to argue over details when the subject is one certainly best treated according to general principles. My opponents believe that protective adaptations have an important influence on predation which is therefore discriminate, while I believe that predation is largely controlled by numerical factors † and tends to be indiscriminate.

One question naturally arising in the mind of the student contemplating the field of protective adaptations is, Do not all organisms belong to one category or

* " The relations between birds and insects," pp. 343–350, 1909.

† Swynnerton, quoted with favour by selectionists, apparently realised this principle, as he says, " Therefore . . . attacks on butterflies, whenever and wherever they are thus outnumbered, are unlikely to be as numerous as those on the insects that outnumber them . . . birds tend to concentrate their attention somewhat specially on what (of an acceptable nature) is at the time most readily obtainable in quantity " (June 1919, *J. Linn. Soc.* (*Zool.*), **33** : 210).

another of theoretically protected forms? But Marshall, as noted previously, states that not all ants are protected, and Poulton says of warningly coloured forms, "If once an insect-eating species were driven to eat any such insect in spite of the unpleasant taste, it would gradually come to devour it with relish, and the insect would be in great danger of extermination because of its conspicuous appearance." * There would appear to be a damaging admission here that the "unpleasant taste" is nothing very consequential if it could with experience be relished. In another connection, Poulton says, "Aposematic colours together with the qualities they indicate, depend for their very existence upon the relative abundance of palatable food supplied by animals with Cryptic colouring." †

This seems rather like throwing the cryptic martyrs to the lions. Is not cryptic coloration often hailed as a nearly perfect defence? Yet according to the argument quoted, predators must depend upon concealingly coloured animals for their main subsistence. Certainly the predators, as a rule, do not starve, hence with consequent certainty organisms "protected" by cryptic coloration must be freely eaten.

The selectionist argument thus admits that many species are relatively unprotected and suffer more severely than protected forms from predatory attack. If this is the case and they maintain their numbers, we have proof that protective adaptations are not essential. The conclusion then is that if these species remain "successful" without "protective adaptations," the others also could get along without such adaptations. On the other hand if all organisms have "protective adaptations," then the fact must be faced that predators and other enemies must live, in fact do live and maintain their numbers, again demonstrating that the "adaptations" are not of decisive importance.

Predators do not devour all of the individuals of species upon which they prey, and parasites do not exterminate their hosts. The "struggle for existence" is not as severe as that. Under natural conditions, the ultimate limits of predation or parasitism are rarely if ever approached. This is something that was understood by Forbes as long ago as 1880 ‡ and has been commented upon by Muir as recently as 1931 § but which has not been taken into account in connection with selectionist theorising.

The phenomenon harmonises, however, with the principle of predation being proportional to population. In the light of evidence (unpublished) by Errington in the case of predators (horned owls on bobwhites) and of Muir's findings ‖ as to parasites, it seems that the statement of the principle should now be modified to

* 1890, *The Colours of Animals*, p. 179.

† 1908, *Essays on Evolution*, p. 137.

There is no ground for using such expressions as "great danger of extermination," and "depend for their very existence," as there is no evidence that species are brought to the point of extermination or anywhere near it by their enemies under natural conditions. Phenomena even hinting at such results are invariably due to alterations in environment produced by man. The great balance of nature, although ever fluctuating, is a reality; populations wax and wane, and with them their enemies. Rarity avoids, abundance invites attack.

‡ "On some interactions of organisms," Nov. 1880, *Bull. Ill. State Lab. Nat. Hist.*, **1**, (3): 1–17.

§ "The critical point of parasitism and the law of Malthus." 1931, *Bull. Ent. Res.*, **22**: 249–251.

‖ "A constant phenomenon that I have observed in the field when the action of a parasite upon its host is studied over a considerable time and area, is as follows. When the host is very numerous, the percentage of parasitism will rise very high, but when the host is scarce, the percentage of parasitism becomes low" (*l.c.*, p. 249).

read that predation and parasitism tend to be proportional to population, the proportion, however, rising and falling progressively with increase or decrease in the numbers of the available food organisms.

This modification in no way affects the suggestions that food supplies are likely to be used more or less in proportion to their abundance and that probably none will be entirely overlooked. The basic factors underlying the action of organic checks certainly tend toward indiscriminacy and the numerical reactions of checks in relation to population are a natural force ever tending to even the fluctuating balance of nature. Admittedly deviations from balance, some even of violent extent, occur, but just as certainly the restorative principle operates and the disturbance subsides. In the long run the relation between producers and consumers is one that is tolerable to both. We are justified in concluding that these opposed groups of organisms are under constant compulsion of a natural and automatic compensatory principle to keep in balance. This balance, like the scales of justice, is impartial and knows no selective advantages, no favoured races.

Papers.

The following papers were read :—

(1) " Abnormal larvae of *Amathes macilenta*, Hb.," by C. N. Hawkins.

(2) " Relations of ants with insects attacking certain poisonous plants in Hawaii," by J. S. Phillips.

(3) " Observations on the Structure, Biology and Systematic Position of *Pantophthalmus tabaninus*," by W. H. Thorpe.

(4) " Studies on Ethiopian Simuliidae, *Simulium adersi*," by E. G. Gibbins.

Wednesday, October 18th, 1933.

Prof. E. B. Poulton, F.R.S., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—The Rev. A. R. Castle, 129, Old Tovil Road, Maidstone, Kent; R. B. Janson, 44, Great Russell Street, London, W.C. 1; B. L. Mitchell, 227, Leigham Court Road, Streatham, London, S.W. 16; J. E. Moss, Farnham House Laboratory, Farnham Royal, Bucks; H. T. Rosenberg, B.Sc., A.R.C.Sc., 55, Leckford Road, Wandsworth, London, S.W. 18; F. Wilson, Farnham House Laboratory, Farnham Royal, Bucks.

Resemblance between a Geometrid (*Semiothisa subcretata*, Warr., BOARMIINAE), a Hesperid (*Sarangesa subalbicans*, B.-B.) and a Lycaenid (*Liptena ilma simplex*, Auriv.).

Prof. Hale Carpenter exhibited a specimen of each of the above Lepidoptera captured by Mr. T. H. E. Jackson, F.R.E.S., at Entebbe, Uganda, September 1932, and read the following extract from Mr. Jackson's letter.

" The three specimens with white undersides were taken together in a small patch of forest between Entebbe and Kampala along the lake shore. The moth and the Liptenine are extremely hard to distinguish—both are found *in* the forest, that

is in semi-darkness, and only the white undersides are visible in flight; possibly they have developed independently for the same reason, *i.e.* protection from a following enemy, since in this light one loses them immediately. The flight is not very similar except when the moth is about to settle, when it adopts the typical, up and down, dancing motion of the Liptenine, showing the white intermittently and drawing the eye too late to follow the direction. The Hesperid is a member, I suppose, with *T. flesus*, which was also present."

Prof. Carpenter remarked that it was most interesting that Mr. Jackson should, independently, have noticed the likeness between the Geometrid and a Hesperid, which he himself had brought before the Society last October (*Proc.*, **7** : 59), but he had not seen the moth alive and was not aware of the habit of flight which Mr. Jackson described as resembling that of the Liptenine.

An apparently undescribed species of LYCAENIDAE mimicking *Vanessula milca*, Hew. (NYMPHALINAE).

Prof. HALE CARPENTER also exhibited a remarkable Lycaenid captured by Mr. T. H. E. Jackson, F.R.E.S., at Katera on the west coast of L. Victoria, Uganda, in October 1932, and read the following extract from a letter from him.

" The next pair came from another large forest near Masaka, on the shore of the lake. A forest department sawmill had cut long rides and laid down rails for trucks, and these made ideal collecting grounds. *Vanessula milca* swarmed all along the edges of the forest, and the little Lycaenid appeared occasionally among them. At rest with folded wings it is an extraordinarily good imitation of the model, and it is only its flight which gives it away."

Prof. Carpenter said he had been unable to identify it at the British Museum. In colour and pattern on both upper and under surfaces the resemblance is very close to the common and conspicuous Nymphaline, *V. milca*.

An undescribed species of SYNTOMIDAE resembling a Scoliid wasp.

Prof. HALE CARPENTER also exhibited two specimens of a species of a Syntomid, *Melisa* sp. sent by Mr. G. L. R. Hancock, F.R.E.S., from Mabira Forest and Kololo in Uganda. Mr. W. H. T. Tams had kindly examined them and found them to be unrepresented in the British Museum. The wings, legs, head, thorax and dorsal surface of the abdomen are blue-black, the end of the abdomen rusty red; the under-surface of the abdomen being reddish-yellow. The resemblance is very strong to a species of Scoliid, which Mr. Benson kindly identified as *Discolia usambarensis*, Cam., also taken in the Mabira forest.

A male of the " Shark " moth *Cucullia lactucae*, Schiff. (NOCTUIDAE), bred in the Oxford district.

The PRESIDENT exhibited the specimen, bred by the late Arthur Sidgwick, 3 June, 1900, and now in the Hope Dept., Oxford Univ. Museum. It had been figured in 1928, *Trans. Ent. Soc. Lond.*, **76** : pl. xx, f. 2, p. 528, by the late F. C. Woodforde. See also 1923, *Ent. Mon. Mag.*, **59** : 8, by Commander J. J. Walker, who first recognised the specimen, which had been placed in the series of *C. umbratica*, L., in the Sidgwick Collection; also 1925, *Entomologist*, **58** : 178, by F. C. Woodforde.

Mr. W. H. T. Tams has kindly added the following comparative notes on the two species :—

lactucae, F. W.: termen more bowed, less oblique; fuscous antemedial and postmedial fasciae prominent; coloration an even fuscous and whitish intermixture, giving a dark greyish tone to the wing; no brown-tinged creamy streak in cell or beyond.

umbratica, F. W.: termen less bowed, more oblique; antemedial and postmedial fasciae difficult to recognise; coloration a brownish and whitish intermixture, giving a light greyish tone to the wing; a definite broad brown-tinged creamy streak from middle of cell towards termen below apex. Cf. Barrett, *Lep. Brit. Is.*, **6**, pl. 240, fig. 2a, ♀.

Compare also the following figures, which show the differences very well:

Seitz, *Gross-Schmetterlinge der Erde*, Abt. I, Band **3**, plate 26 f (*umbratica*) and 27 a (*lactucae*); Culot, *Noct. et Géom. d'Europe*, **2**, pl. 61, fig. 6 (*umbratica*), fig. 8 (*lactucae*).

On the behaviour of a moth injured by an ant.

The PRESIDENT said that the following interesting observation had been extracted from a letter written at Kitale, Kenya Colony, on 1 October, 1933, by Mr. T. H. E. Jackson, F.R.E.S.:—

"A moth was struggling to get away from an ant which had hold of one of its legs. In the course of the struggle the leg broke and I placed the moth on a tree-trunk. It immediately uncurled its proboscis and proceeded to suck the wound, continuing to do so for several minutes, after which it settled down against the trunk." Mr. Jackson added, "I wrote 'seconds' above but it was at least two minutes."

Such behaviour as that described above was entirely new to the speaker and to all the friends who had been consulted. It was, however, only too likely to be passed over, but now that attention had been directed to it we might hope that it would be seen and carefully observed on other occasions. The object of the action was probably to reduce the loss of fluid—a reduction which may have been brought about by the promotion of coagulation as well as by direct absorption.

[Mr. Jackson kindly sent by air-mail an example of the moth referred to above. It arrived Nov. 13, was found to be *Miscelia inferior*, Guén., ♂ (HADENINAE), by Mr. W. H. T. Tams and exhibited to the Society on Nov. 15.—E.B.P. 24 Nov. 1933.]

Inhibited response to disturbance and other notes on the larvae of the Pine Hawkmoth.

The PRESIDENT said that, owing to the kindness of his friend Mr. H. L. Andrewes, F.R.E.S., he had been enabled to watch, for the first time in his experience, the life-history of the larval *Hyloicus pinastri*, L. Mr. Andrewes wrote on 8 July, 1933:—

"I am glad the *pinastri* eggs arrived safely. I do not suppose that those which hatched en route will be any the worse for it. They could only have been out a few hours, for not one had hatched when I packed them at mid-day on the 6th.

"The parents, which had evidently only just separated, were found, 27 June, on a pine trunk on Decoy Heath, by the road between Wareham and Morden, about 2½ miles N. of Wareham. The female laid several dozen eggs the same night, and these began to hatch on the 9th day. The larvae I reared 3 or 4 years ago were just 5 weeks before pupating. I found them extremely easy to rear, but people seem to

find it difficult to deal successfully with the pupae. I feel sure the best thing is to leave them quite undisturbed and exposed to natural conditions, say under a N. wall.

" On the same evening (about 6 p.m. G.M.T.) that I took this pair I found another female with wings still flaccid. When I set her I found that she had a deep emargination of the L.H.W. I will hand her to you when an opportunity occurs; she is still on the setting-board—very much so, as she exuded much fluid and is stuck to the board, etc., fortunately on the R. or normal side only."

The President communicated the following notes:—" In watching the larvae through their stages I was, as in other instances, much impressed with the excellence of Prof. August Weismann's account in *Studies in the Theory of Descent*, translated by Prof. Raphael Meldola (Lond., 1882, pp. 264–9, pl. iv, figs. 53, 54). One or two special points unrecorded by this great naturalist are mentioned below.

" There was very marked variation in the size of the opening made in the egg-shell by the larvae. While the great majority were content with a comfortable emergence and took no further interest in the shell, a small proportion continued after hatching to eat it until half or even three-quarters had been gnawed away. The forked caudal horn, described and figured by Weismann in stages 1 and 2 and believed by him to have lost the fork in stage 3, was certainly retained in this and I believe also in stage 4 by many larvae. The great development of the fork, well shown in Weismann's figures, was very evident, as also the wonderful change, at the last ecdysis, from a larva resembling the pine-needles to one resembling the brown rough twigs of the pine. It was at this fifth and last stage that the inhibited response to disturbance was observed. Several larvae were kept in glass cylinders each covering a pine-branch of which the stem passed through a plate (forming the floor) into water below. A larva while feeding was stretched along the pine-needle and gnawed steadily and very speedily from the tip to near the base. In cleaning these little cages the cylinder was removed and the plate, bearing the pine branch and larvae, was held vertically so that the faeces fell on to a sheet of paper. In spite of this disturbance the larvae continued to feed during the whole performance. Often the faeces became wedged between the bases of the needles, and the plate had to be turned upside down and sharply shaken in order to dislodge them; but even then the larvae always continued feeding as if nothing were happening. I was reminded of the behaviour of the " Adonis Blues," *Agriades thetis* (*bellargus*), Rott., described in our *Proceedings* for 1916 (p. lxxviii)—butterflies barely disturbed by gentle tapping or stroking with the end of a long grass-stem. If too sensitive to such disturbance, these " Blues " would be continually liable to interruption in periods of rest between the flights or of feeding, on the windswept downs and meadows which they frequent. And similarly the Pine Hawk larvae clinging to the needles of the smallest pine-branches swaying in every light wind would, if readily sensitive to disturbance, be constantly interrupted while feeding on a relatively innutritious substance which must be consumed in great quantities and is so consumed as proved by the large amount of the faeces passed by these caterpillars."

***Phalera bucephala* larvae attacked by the Pentatomid bug *Picromerus bidens*.**

Mr. H. M. Edelsten read the following note :—

" While in Worth Forest in August my son drew my attention to a birch tree on which was a pair of these bugs, the ♀ sucking a larva of *P. bucephala*. There was a

whole brood of larvae of *P. bucephala* on the tree, so before leaving we put another larva in the box with the bugs. When we reached home the bugs had separated and both ♂ and ♀ were busily engaged in sucking the juices of the new larva.

" Mr. N. D. Riley has kindly given me the following extract from Butler, 1923, *A Biology of the British Hemiptera-Heteroptera*, p. 68 :—

" But, as already stated, *Picromerus* is a carnivorous insect and visits the above plants for what prey it can find on them. The earliest record is that of De Geer, who says it feeds upon the larvae of HEMEROBIIDAE (lacewing insects) and of CHRYSOMELIDAE (Coleoptera). Kühn describes it as an excellent remedy against the bed-bug, *Cimex lectularius*, saying that six or eight specimens of *Picromerus bidens*, when shut up for several weeks in a room swarming with bed-bug, completely extirpated them. In the New Forest Lucas found a ♀ on, and apparently eating, the dead larva of the fox-moth, *Bombyx rubi*, L., and Giard found it sucking the larva of the moth *Acronycta rumicis* on *Polygonum*. Poulton gives the larvae of *Nematus viminalis*, whose ravages on *Salix cinerea* it thus checks. Schumacher also gives examples of the following : amongst Lepidoptera, larvae of *Pieris brassicae*, *Orgyia antiqua*, *Spilosoma lubricipeda*, *Sphinx tiliae*, *Phalera bucephala*, *Acronycta psi*, *Polia chi*, *Dianthaecia capsincola*, and imagines of *Melitaea* and *Lymantria monacha* ; amongst Coleoptera, *Galeruca viburni*, and *Phyllobrotica quadrimaculata* ; and also larvae of saw-flies and aphides. To these I can add both the larvae and pupae of *Pieris rapae*, and the white larva of the saw-fly, *Phymatocera aterrima*, Klug, that lives on Solomon's Seal. But perhaps most remarkable of all, I have found the nymph ready to attack the larvae of *Euchelia jacobeae* when other supplies failed. As long as other species were available, it avoided these, but when it could get nothing else it boldly attacked these caterpillars, notwithstanding their warning coloration. From these various facts it will be seen that *Picromerus bidens* may rank amongst insects useful to agriculturists, though it is probably not common enough in the British Isles to make much difference to British farmers."

The PRESIDENT said that Butler's observations on the food preferences of the Pentatomid were extremely interesting and he hoped that they would be repeated with a full record of the insects accepted when some species distasteful to the bug was refused.

[Inasmuch as it is convenient as far as possible to group together observations bearing on the same subject, the following brief notes are now appended.

1. My friend Mrs. Cornish wrote, 19 March, 1933, from Astley, nr. Stourport, Worcs.—" In early September my grandchildren had a setting board with a number of butterflies and moths on it. It was put in a room at the top of the house for safety. On looking at it the next day they found that the Lepidoptera on the board had been attacked by wasps which were carrying them away piecemeal. All had been spoilt with the exception of some *Six spot Burnets*, which the wasps did not touch. The Burnets are so sluggish and easily caught that I have often wondered why they were so numerous, but I suppose now that they are protected by warning coloration."

It is by no means certain that the wasps were repelled by the warning colours, but very probable that they were warned in some way, perhaps by smell, of the qualities which other enemies associated with the aposematic appearance.

2. On the 6th of last June I threw a large female " Tiger Moth " (*Arctia caja*, L.) into the fowl run at 56 Banbury Road, Oxford. The birds clustered round expecting food but only a single one gave a half-hearted peck which did not disable the moth for it flew about freely and finally escaped through the wire netting. Before this, however, it was recaptured two or three times and again thrown into the run and also into an adjacent one. It was not touched again but inspected by a few hens at a distance of from 6 in. to a foot but never nearer.

E.B.P., 6 Nov., 1933.]

A Tachinid emerging from an Adult Moth.

Mr. H. M. Edelsten exhibited a specimen of *Zygaena lonicerae* and a Tachinid fly *Phryxe vulgaris* which had emerged from the body of the moth. He said :—

While at Wood Walton Fen at the beginning of July this year I took a pair of *Zygaena lonicerae*. The ♀ was kept for eggs. She only lived 2 days after laying about 30 eggs. I wondered why she had died so soon, as another ♀ taken the same day was still alive 10 days later. Subsequently on looking at the box to see if the eggs had changed colour I was surprised to see a pupa of a parasite protruding from the moth's body. The body was completely hollowed out. The parasite hatched later and has been identified as *Phryxe vulgaris* ♀ by Miss Aubertin who has kindly mounted the specimens.

I presume the larva was parasitised just before it spun its cocoon, and the *Phryxe* larva had not time to complete its development or injure the moth sufficiently to prevent it hatching and pairing. It is interesting to note that the eggs laid by the Burnet duly hatched.

In *British Lepidoptera*, **4** : 434, Tutt mentions records by von Glehn (*Entomologist*, **3** : 28, 29) of two parasitical larvae making their exit through a small hole in the wing-cases of two pupae of *Manduca atropos*. The pupae were not killed and produced moths four hours later. Also by Marshall (*Ent. Mon. Mag.*, **32** : 265) of an imago of *M. atropos* that was eviscerated by Morres, and was found to contain a large parasitic maggot. Morres noticed that the *M. atropos* larva, which was two-thirds grown when he received it, exhibited a black speck on its body, from which it was inferred that it was parasitised; Marshall observes that in the ordinary course of things, the parasitic larva would have lived through the winter in the pupa of *M. atropos*, but that the forcing of the pupa, so that the moth emerged after a very short pupal period, left the parasite no time to cause its death nor was the exhaustion of the vital juices sufficient to prevent the final metamorphosis.

Dr. Cockayne in 1911, *Entomologist*, **44** : 253, records the larva of a Dipterous parasite emerging from the body of a living ♀ *Nyssia lapponaria* which he had had alive in a box for some days. Curiously enough the parasite in this case was also *Phryxe vulgaris*. He suggests that if these flies have several broods it is possible that the egg of the parasite might be laid on the body of the moth. Females of *N. lapponaria* live more than a fortnight, and some of these parasites pass through their early stages much more quickly than this.

An experiment in Hybridisation between *Celerio galii* and *Rhodafra opheltes*.

Mr. H. M. Edelsten on behalf of Mr. G. Edelsten of Sepani, Orange Free State, said :—

" Pupae from an autumn brood of *C. galii*, bred in Germany, were imported from England towards the end of December 1931, arriving in South Africa early in January 1932—considerable luck attending the delaying of emergence until a few days after arrival. Pairings for the establishment of a South African bred brood of the species were started at once, and, at the same time, as many wild larvae of *R. opheltes* as possible were collected for use in the proposed hybridising experiment. In all, some ninety *galii* and sixteen *opheltes* larvae pupated a little difficulty being experienced in rushing the former through to the pupal stage before winter set in and frost destroyed the available supply of the food-plant, a local species of Yellow Bedstraw. Emergences of both *galii* and *opheltes* moths started simultaneously at the end of September 1932, carrying on until the middle of the following month, during which time every effort was made to bring about cross-pairings between the two species. It may be noted, incidentally, that the South African bred *galii* were considerably paler in colour, and smaller in size, than moths of the imported parent stock. Access to books giving details of the various methods adopted in similar hybridising experiments not being obtainable, only two ways of effecting cross-pairings were given a trial. Males of, say, *opheltes* were placed on one side of a wire-gauze partitioned breeding-cage, with a female *opheltes* on the other side to excite them, or, alternatively, the males were accommodated in a single compartment cage, and the female, protected in a wire-gauze box, put in with them. In both cases, when it was judged that the correct amount of sexual excitement had been roused, the *opheltes* female was removed, and a *galii* female substituted—this time, however, freely accessible to the males. As the result of the different cross-pairings thus obtained, several batches of ova, comprising several hundreds, were collected, these, in every case, being deposited by *opheltes* females. All the ova collected during the earlier part of the experiment proved, however, to be infertile, and it was not until the end that four minute larvae, hatched out in a cage that had been occupied by *galii* males and an *opheltes* female, were secured. Three of these four larvae survived the larval stage, and, in due course, pupated. During the feeding-up period they had, for company, eight doubtful larvae,—an accidental male and female *opheltes* pairing being suspected,—also two wild *opheltes* larvae, introduced with the food-plant—a species of white scabious—on which all the larvae were reared; this being the natural food-plant of *opheltes*. Normally, there is very little difference in the markings and general appearance of *galii* and *opheltes* larvae, the variations in the ground-colour—from green to dark brown—however, occurring in both species; but it was noted that whereas the three hybrid larvae had the dark brown ground-colour of the parent stock *galii* larvae, that of the doubtful and wild larvae showed the usual green and dark brown variations. Again, comparing the pupae, it was noticed that while those of the doubtful and wild larvae were typical *opheltes*, the hybrid pupae, though similar in other respects, yet showed a decided difference in the possession of an abnormally blunt tongue-sheath. Moths emerged from the doubtful and wild pupae during December 1932—the usual period of metamorphosis—and proved, in each case, to be normal specimens of *opheltes*, and of the three hybrid pupae two produced moths (both females) on June 4th, 1933—almost mid-winter in South Africa, and an unusually cold one at that—while the third seems likely to carry over until next spring. Dr. van Son, entomologist at the Transvaal Museum, Pretoria, has kindly examined, and reported on, one of the two

galii × *opheltes* specimens sent to him for inspection, and pronounces it to be a hybrid, showing almost complete dominance on the side of *opheltes*. Besides exhibiting the second, narrow, black abdominal side patch of *galii*, the basal black patch of the fore-wing, as well as the hairs near the inner angle of the fore-wing, show some resemblance to that species, while the general colour of the hind-wing is more nearly the brick-red of *galii* than the bright cerise of *opheltes*.

" Attempts to cross the opposite sexes, and also to breed a second South African

Fig. 1.—Above, *Celerio galii* ♂; centre, *Rhodafra opheltes* ♀; below, ♀ hybrid *galii* ♂ × *opheltes* ♀.

bred brood of *galii*, for the continuance of the experiment, proved abortive, and though, in the second instance, pairings were observed to take place no ova resulted. An examination of the *galii* females showed them to be either completely barren, or at best, carrying only a few ova in a very early stage of development, and one surmises from this that climatic differences and, perhaps, altitude—4500-5000 feet above sea-level, at this point—must have impaired their fecundity.

" The difference in the South African and English seasons—midsummer in the

latter corresponding with midwinter in the former—coupled with the probable difficulty in again securing simultaneous emergences of the imported and local moths, rather militate against a successful repetition of this particular hybridising experiment here."

A large example of *Creophilus maxillosus*.

Mr. A. J. Richards exhibited a specimen of *Creophilus maxillosus* which was an unusually large individual.

Wednesday, November 1st, 1933.

Prof. E. B. Poulton, F.R.S., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—Miss Doris M. S. Brown, Imperial College Field Station, Slough, Bucks; Eric Burtt, B.Sc., D.I.C., Wantage Hall, Reading, Berks; Dr. Hans Bytinski-Salz, Deutsch-Italienisches Institut für Meeresbiologie, Rovigno d'Istria, Italy; D. Coghill, Merebank, Near Durban, Natal; Colonel Sir S. R. Christophers, I.M.S., F.R.S., 80, Onslow Gardens, South Kensington, S.W. 7; Mohamad Riazuddin, B.Sc., Rajahmindry, Madras Presidency, India; Mrs. M. J. Richards, 30, Mackenzie Street, Slough, Bucks; K. Vajropala, B.Sc., A.R.C.S., Department of Entomology, Imperial College of Science and Technology, S.W. 7; D. Vesey-Fitzgerald, B.Sc., Imperial College of Tropical Agriculture, Trinidad, B.W.I.; Arthur Welti, Roswyn, 141, Perry Vale, Forest Hill, S.E. 23; Mrs. I. M. T. Welti, Roswyn, 141, Perry Vale, Forest Hill, S.E. 23.

Notes on *Thera juniperata*, L.

Dr. E. A. Cockayne said : " On 20th August I beat larvae of the above species in Surrey and kept them in a cupboard in a biscuit tin, which was only opened once and exposed to light for about half-an-hour until September 8th. On that date 229 had pupated, and of these 227 were black and 2 were green. The remaining larvae were sleeved on a branch of juniper and kept in full daylight, and these produced 101 pupae, all of which were green. Under natural conditions the green form is the usual one, for of 101 pupae of the race *scotica* beaten from *Juniperus nana* 99 were green and only 2 were black.

" I have beaten larvae and pupae in two previous years and noticed that most of the moths were females, but put this down to the fact that late larvae are more likely to produce female imagines. This year I beat the juniper about four miles west of Ballater on September 15th and 27th and beat nothing but pupae. Of the imagines (race *scotica*, Buchanan-White) 15 were males and 89 females; 16 pupae were parasitised and 2 died. The excess of females occurred in pupae collected on both days. Larvae beaten from *Juniperus communis* in Surrey gave males and females in approximately equal numbers.

" The race *scotica* probably reached Scotland with its food-plant, *Juniperus nana*, by the Scandinavian land-bridge, whereas the English *juniperata* probably came

across the Channel with *Juniperus communis*. The race *scotica* is smaller, more variable, and rather different in facies. I think it emerges earlier; all my *scotica* hatched between September 29th and October 11th, while the English *juniperata* hatched between October 5th and 23rd. It gives about 10 per cent. of females with the posterior third of the median band altogether absent, a form I have not seen in an English specimen, and a still higher percentage with the band divided, the posterior part in some cases only represented by a little dot, ab. *divisa*, Strand. About 6 per cent. are melanochroic, the blackening being most obvious on the abdomen and underside. All these forms are shown.

" I am also showing two typical specimens from N.E. Surrey with six examples of a melanic form discovered a few years ago by Mr. Wakely. Of this form I bred 3 out of 299 imagines in 1931, and 9 out of 333 this year, 1933, so that, taking the two years together about 2 per cent. on this hill-side are melanic. I describe it as follows :—

Thera juniperata ab. **nigra,** ab. n.

Wings, thorax, and abdomen blackish-brown; the markings obscured, but not completely hidden. Median band bordered on both sides by a narrow white or pale grey line, basal area bordered externally by a narrow grey line, submarginal line pale grey. Along the termen is a series of narrow white interneural dashes. Legs black with white rings at the segments."

Wasps avoiding printers' ink.

Mr. O. W. Richards exhibited part of a notice printed on paper that had been glued to a notice board in fields at Slough, his attention having been directed to it by two students at the Imperial College of Science, Messrs. Freeman and Callan, who had noticed that wasps (*Vespa* spp.) while attacking the white paper left the printed matter severely alone. In some instances the wasps had picked out the centre of letters, *e.g.* O and A. Mr. G. H. Mansbridge has also observed this avoidance of the actual print in the case of advertisements on hoardings.

Hymenopterous parasites of adult beetles.

Mr. O. W. Richards exhibited specimens of two species of the Braconid genus, *Perilitus*, which were of some interest in connection with Mr. Edelsten's exhibit at the last meeting, when a Tachinid which had emerged from an adult Lepidopteron was brought forward. There are a number of Tachinids and Braconids which are habitually parasites of adult beetles. The Braconid genus *Perilitus* contains some of the best known species. Of the two exhibited, *P. bicolor*, Wesm., has been recorded by Kaufman (1923, *Arb. biol. ReichsAnst.*, **12** : 109) as a parasite of *Phyllotreta* sp. One of the specimens exhibited was noticed at Slough sitting on a cabbage leaf, standing guard over a *Phyllotreta atra*, Pk., in which it was probably about to lay eggs.

The other species, *P. aethiops*, Nees., is also recorded by Kaufman as a parasite of *Phyllotreta*. Jackson (1922, *Ann. Appl. Biol.*, **9** : 93) records it also from a weevil, *Sitona hispidula*, F. Newton (1931, *Ent. Mon. Mag.*, **67** : 82) bred *P. aethiops* from larvae of *Phyllotreta nemorum*, L. Apparently, therefore, within the same genus species may emerge from either larvae or adults.

Colour varieties of *Phorodesma pustulata*.

Mr. A. Robinson and Mr. H. M. Edelsten exhibited two curiously coloured forms of *Phorodesma pustulata* taken at light in mid-Sussex on June 23rd, 1933. Instead of being green with pinkish cream blotches the whole of the wings were of a pinkish cream colour and the blotches were whitish.

An asymmetrical specimen of *Coremia designata*.

Mr. H. M. Edelsten also exhibited a specimen of *Coremia designata*, the band on the left fore-wing being narrower and darker than that on the right fore-wing. The specimen came to light in mid-Sussex in July 1933.

Photographs of African Butterflies.

Prof. P. A. Buxton exhibited photographs taken at Gadau, in the north of Nigeria, showing *Charaxes jasius epijasius* feeding at sap flowing from an injury to a tree, *Poinciana regia*.

Rodney C. Wood on the mimetic resemblance of the ♀ Nymphaline butterfly *Euxanthe wakefieldi* to the Danaine *Amauris niavius dominicanus*, observed in Natal.

The President said that he had received the following interesting letter from his friend Mr. Rodney Wood, who had written, 19 June, 1933, from the Golf Course Hotel, Umkomaas, Natal :—

"As I am staying here till September, after which I return to Rhodesia, I am delving into the local butterflies, and to my joy have made my first acquaintance with *Euxanthe wakefieldi*, Ward.

" Has anybody yet recorded the mimetic resemblances of the ♀? Having none of my books by me I cannot tell, but the following may interest you.

" On the 24th May I came upon a ♂ *Euxanthe*, sitting in characteristic Charaxid fashion on a twig in a thicket glade. It flew off with the to-be-expected Charaxid quick, jerky flight, and although I only knew of it from an illustration and was not expecting it here, I at once recognised it. It returned several times and after some awful moments I took it safely and a little later caught another. About two hours afterwards I was in another spot where I was looking for the *trophonius* ♀ form of *Papilio dardanus cenea*, Stoll, and also *Hypolimnas mima*, Trim., both of which were in flight. *Amauris niavius dominicanus*, Trim., was also about and *H. wahlbergi*, Wallgr. Suddenly I saw *float past with its characteristic gliding flight* what I took to be a *hippocoonoides*, Haase, ♀ form of *P. d. cenea* or possibly an *Amauris dominicanus*. By good luck I pursued it and after killing it found I had the ♀ *wakefieldi*. I took another within half-an-hour.

" On 11th June I was out again in the same place. A black-and-white butterfly leisurely planed over the tree-tops and fluttered round a tree at some 15–20 feet from ground. A friend with me spotted it first and called to me, ' Here's an *Amauris*—nice specimen—bring your long net.' I walked up and noticed the butterfly sitting in characteristic *Papilio* pose at the tip of a leaf—wings together and drooping. A moment later it fluttered to another leaf and oviposited, after

which it planed round over the trees and disappeared. I called back to my friend—'It's a ♀ *cenea* and is ovipositing; I'll wait for it to come back.' Within a few minutes back it came and suddenly planed over my head in full perfect view. I then saw it was *Euxanthe wakefieldi*, ♀, once more. There was no doubt whatever.

"Now note the interesting points: not only colour and size resemblance, but flight as compared with the ♂, is 'Papilionine' or 'Amaurine' and not at all 'Charaxidine,' and also the habit of settling is modified to that of the typical ♀ *cenea* or *A. dominicanus*. As ♀ *cenea* mimics *A. dominicanus* it seems to me the ♀ *wakefieldi* does too, and is very successful at it!"

It was extremely interesting to receive this entirely independent confirmation of the conclusions recorded by his friend Canon St. Aubyn Rogers in 1908, *Trans. Ent. Soc. Lond.*, **1908**: 489, pl. XXVII—conclusions referring to *Euxanthe wakefieldi* in the coast region of Brit. E. Africa (Kenya Colony). His friend Sir Guy Marshall had kindly written the following note on the invasion of Natal by this species.

"1933, July 13—With regard to *Euxanthe wakefieldi*, I fear that I was not able to make any observations on this insect in Natal. At the time that I was there the species was extremely rare, only a few specimens having been observed. They were evidently the forerunners of a southern invasion, because I heard afterwards that it became comparatively common. The same thing happened with regard to both *Hamanumida daedalus*, F., and *Metacrenis rosa*, Hewits. I remember Alfred Millar telling me that he could recall the time when *Hamanumida* first appeared in Durban, and was considered quite a rarity. *Metacrenis* began to appear in the 'nineties."

H. V. O'Donel on the nesting association between an Indian bird, *Ploceus megarhynchus*, and the Jungle bee, *Apis indicus*, Fabr.

The President said that his friend Mr. E. C. Stuart Baker, O.B.E., M.B.O.U., had kindly directed his attention to the following interesting addition to these significant associations, many of which are recorded in our *Proceedings*:—

"13 *July*, 1933—This extract may interest you: 1916, *J. Bombay Nat. Hist. Soc.*, **24**: 821—'I send you a photo taken by myself of a hive of the jungle bee, *Apis indicus*, with the nest of the Eastern baya, *Ploceus megar[h]ynchus*, alongside of it. This is the third instance I have come across.' The note is signed 'H. V. O'Donel, Hasimara P.O., Duara, 22nd June, 1916.' The photo was unfortunately spoilt and could not be reproduced. O'Donel was a good and correct observer. Hasimara is in Behar, North East India."

Dr. H. H. Karny on a Bornean Tettigoniid (Locustid) insect described by R. Shelford as a mimic of a Coccinellid beetle, such as *Caria dilatata*.

The President said that his friend Dr. R. Hanitsch, Ph.D., had kindly directed his attention to Dr. Karny's paper in 1932, *Sbornik Ent. Nár. Mus. Praze*, **10**: 110–12, referring to the late R. Shelford's memoir on "Some Mimetic Insects and Spiders from Borneo, etc." (*Proc. Zool. Soc.*, **1902** (2): 230). The Tettigoniid, described below as *Coccinellomima shelfordi*, by Karny, was placed by Shelford as one of six mimics of the common Coccinellid type of pattern and colouring represented by *Caria dilatata*, F., fig. 30 on his plate XXIII, where the mimics were also shown (figs. 31–36).

Dr. Hanitsch had added to his kindness by preparing the following abstract of Dr. Karny's paper.

Coccinellomima shelfordi, Karny.

"Shelford, in *Proc. Zool. Soc.*, 1902, II, p. 235, pl. xxiii, fig. 34, described and figured a curious insect from Sarawak which seemed to mimic a Ladybird, and which he took for a Locustid. He sent it to Brunner for examination who placed it near *Gammarotettix* (subfam. RHAPHIDOPHORINAE). But as *Gammarotettix* is a Nearctic genus, Karny, doubting Brunner's determination, asked Mr. Banks of the Sarawak Museum, to send him the insect. Karny comes to the conclusion that the insect cannot belong to the RHAPHIDOPHORINAE, (1) because it lacks the strongly compressed fastigia of that family, and (2) because its anterior tibiae show large tympana. He therefore places it under the HENICINAE,* a sub-family near the STENOPELMATINAE which, however, possess no tympana.

"The single specimen is apterous and very small, but Karny concludes that it is full-grown on account of its strongly chitinised body. Its sex could not be determined, as the abdominal tergites are so strongly bent downwards as to cover almost entirely the end of the abdomen.

"Dr. Karny has, with Mr. Banks's permission, transferred the specimen to the Hope Dept."

Adaptable Protective Resemblance of an Acridian (Orthoptera) of the genus *Oedipoda* to the rocks of its localities, by J. A. Simes.

The three grasshoppers exhibited were taken last July in the S. of France. They belong to a single common species—*Oedipoda germanica*, Charp.—and they are interesting as showing close colour adaptation to their environment.

One was taken at Agay in the Estérel Mts.—a volcanic tract, some 12 miles long with a maximum depth of about 9 miles, which extends from near St. Raphael on the Riviera to the neighbourhood of La Napoule near Cannes. The prevailing rock is a red porphyry; and the grasshopper from Agay has a coloration which exactly matches the tint of the rock—so closely indeed that some searching was necessary to locate the insect after a short flight. All the insects of this species seen in the Estérel were of this reddish form.

The small volcanic tract of the Estérel is surrounded on the landward side by the foothills of the Alps and their subsidiary chains. The prevailing rock in these hills and ranges is limestone; and the grasshoppers found on this terrain are all coloured grey like the rock. The two specimens exhibited with a piece of the prevalent rock show how closely their coloration corresponds with that of their environment. The insects exhibited come from Draguignan, some 40 km. from Agay; but the grey form is to be met with immediately the red rocks of the Estérel are replaced by the grey limestones of the hinterland.

My impression is that this species of grasshopper is very adaptable in the matter of coloration: and I think I am right in saying that in some parts of the Basses Alpes, *e.g.* near Digne, where the limestone over large areas assumes a

* Not given in Kirby's "Synonymic Catalogue"; probably one of Karny's sub-families.—R. H.

brownish tint, the colour of the grasshopper exactly reproduces the tone of the rock. I wish to thank Mr. B. P. Uvarov for kindly naming the species.

The President said that the specimens exhibited by Mr. Simes were the best instances of adjustable Protective Resemblance that he had seen in any European Acridian. The grasshoppers, *Stauroderus bicolor*, L., which matched the red-brown earth of Heligoland and the sand or grasses of a sand-bank, the Düne, only three-quarters of a mile away, were also good but less striking examples (*III. Int. Ent.-Kongr., Zürich*, 1925 (1926), **2** : 437).

Wednesday, November 15th, 1933.

Professor E. B. Poulton, F.R.S., President, in the Chair.

Election of Fellow.

The following was elected a Fellow of the Society :—H. J. Craufurd Benson, B.Sc., 45, Gordon Place, Kensington, W.8.

Nominations.

The Secretary read the following list of Fellows nominated by the Council for the ensuing year :—

For President : S. A. Neave, O.B.E., M.A., D.Sc.
For Treasurer : Francis Hemming, C.B.E.
For Secretary : A. W. McKenny-Hughes, D.I.C.

For other members of Council :—Prof. W. A. F. Balfour-Browne, F.R.S.E., Sir T. Hudson Beare, B.Sc., F.R.S.E., Prof. G. D. Hale Carpenter, M.B.E., D.M., C. L. Collenette, Brigadier W. H. Evans, C.S.I., C.I.E., D.S.O., K. Jordan, Ph.D., F.R.S., R. W. Lloyd, Miss C. Longfield, Sir Guy A. K. Marshall, C.M.G., D.Sc., F.R.S., Prof. E. B. Poulton, M.A., D.Sc., F.R.S., N. D. Riley, W. H. Thorpe, M.A., Ph.D., V. B. Wigglesworth, M.A., B.Ch., M.D., C. B. Williams, M.A., Sc.D.

Exhibits.

Notes on the Oviposition Habits of Two Hymenopterous Egg-Parasites of *Axiagastus campbelli*, Dist. (Pentatomidæ).

Mr. R. A. Lever said :—Two arrhenotokous genera of Hymenopterous parasites —*Microphanurus painei*, Ferr. (Scelionid), and *Anastatus axiagasti*, Ferr. (Eupelmid) —reared by Tothill and Paine (1) from the egg-clusters of *Axiagastus cambelli* are fairly widely distributed throughout the British Solomon Islands (W. Pacific).

The average number of Pentatomid eggs in a cluster is fourteen. In the case of *Anastatus*, oviposition takes ten to twenty minutes and begins by the female tripping over the surface of the egg with the antennae gently vibrating distad of the scape. After fastidiously selecting an egg, the insect finds a spot in the chorion through which it bores a hole with the ovipositor, a task which occupies some six minutes during which there is only a slight swaying motion of the body, the legs remaining rigid. Following the withdrawal of the ovipositor comes the most interesting phase, comprising a rapid movement backwards so as to bring the head of the insect

to the edge of the perforation, through which there issues a drop of fluid which has apparently been excreted during the puncturing. On exposure to the air the outer portion of this globule hardens quickly to form a cone, presumably a respiratory funnel, while the fluid portion is immediately imbibed, after which the insect moves well away from the egg, which may be left for a minute. On her return, she may rest for some seconds before chewing the cone flush with the chorion, an operation which takes some five minutes. This is followed by the actual oviposition, in which the ovipositor is re-inserted into the hole and is noticeably curved while the egg is extruded; this, the final phase, occupies about two minutes.

It was noticed that after thus parasitising a number of eggs, there was a distinct waning of enthusiasm as the whole proceeding seemed subsequently to require much more effort.

In contrast to *Microphanurus*, shortly to be described, a female *Anastatus*, while engaged in egg-laying will at once cease if disturbed by another individual wandering over the same or an adjacent egg. Hence in breeding the latter insect it is necessary to place only one female with each egg-mass.

The subsequent development of the parasitised egg is characteristic: the original china-white colour, as laid by the Pentatomid, changes in the course of a day or so to orange which later turns to a brownish-purple. Sixteen days after being parasitised the Eupelmid emerges, there being no periodic variation in the two sexes. The emergence hole is sub-circular in shape and its edges are only slightly indented.

The much smaller female *Microphanurus*, when about to parasitise an egg, tiptoes delicately over the surface with the relatively long antennae so flexed as to simulate limbs. She generally comes to rest on the substratum on which the egg-cluster is lying, taking up such a position as to be in contact with the outside eggs. The ovipositor is extruded and dragged across the chorion till a *point d'appui* is located, when the egg is laid. The whole operation takes only two minutes on the average; a variation of one and a quarter to three minutes has been noted. This is in striking contrast to *Anastatus*, from which it further differs in the marked disregard it shows to the presence of other individuals in its vicinity, as it is not disturbed even when walked over. Occasionally two may be seen actually fighting, either biting each other's wings or engaging in a brief tussle.

No instance was seen of any mutual assistance being rendered as described by Squire (2) in *Telenomus*. Although two females may oviposit in the same egg at a given moment, more than one parasite has not been reared from one host-egg.

After the withdrawal of the ovipositor it is carefully wiped clean on the chorionic processes before being retracted between the stylet-sheaths. Before leaving to attack another egg there is a final tiptoeing suggestive of a confirmatory inspection of the seat of operations.

Four days after being thus parasitised, the host-egg develops a black meridional band—Tothill (1) describes this as equatorial though it is just below the ring of chorionic processes—and eight days later (*i.e.* twelve days in all after parasitisation) the parasite emerges through a sub-rectangular hole the edges of which are bordered by thin flaps of ruptured chorion.

This parasite was found to be about nine times as numerous as *Anastatus* on Tulagi Island in August 1932, since 60·4 per cent. of the egg-masses were parasitised

by *Anastatus* as compared with 6·7 per cent. of the former. In addition, it will successfully sting eggs which are five days old, that is up to two or three days before they are due to hatch.

It is, perhaps, worth recording here that Shang (3) has reared the same two genera of Hymenopterous parasites from the eggs of the Pentatomid *Tessaratoma papillosa* in South China.

(1) Tothill, J. D., 1929, A Reconnaissance Survey of Agricultural Conditions in the British Solomon Islands Protectorate, Fiji.
(2) Squire, F. A., 1932, *Nature*, **129**: 544.
(3) Shang, C. K., 1931, *Lingnan Sci. J.*, **10**: 399. (Reference from 1932, *Rev. Appl. Ent.*, **20**, A.)

Some Coleoptera from Windsor Forest.

Mr. H. Donisthorpe exhibited two species of Coleoptera from Windsor Forest, of which the first consisted of a species new to science, which he had found in some numbers in a swan's nest on 6th June, 1933, and which Mr. J. H. Keys had described as *Atheta oloriphila*, and the second was a small *Cis—C. quadridentulus*, Perris, new to Britain, which he had taken in a small piece of the " Dryad " fungus in a hollow beech tree on 27th June, 1933. He mentioned that in other years this fungus had been much more plentiful on this tree, and it was here that he had discovered *Dorcatoma serra*, Panz., and other rare species.

The Mechanism of Stretching in the Cuticle of *Rhodnius prolixus*.

Dr. V. B. Wigglesworth said :—*Rhodnius prolixus* will take from six to twelve times its own weight of blood at a single meal in the nymphal stages, and up to three times its own weight as an adult. The abdominal wall must therefore be capable of considerable distension, but the mechanism of stretching is quite different in nymph and adult. In the nymph, the cuticle consists of a thick elastic endocuticle, and a very thin epicuticle which is thrown into stellate folds; during feeding, the endocuticle is stretched, and the folds in the epicuticle are more or less smoothed out. In the adult, the outer part of the endocuticle over most of the abdomen is impregnated with hard material and cannot be stretched; but at the sides of the abdomen there is a longitudinal pleat which can be unfolded during feeding. Further, in the lower wall of this pleat, the endocuticle is entirely soft and the epicuticle excessively folded; consequently this membrane can be enormously stretched.

A full account of the cuticle in *Rhodnius* is published in 1933, *Quart. J. Micr. Sci.*, **76**: 269–318.

The times of activity of certain British Lepidoptera during the night.

Dr. C. B. Williams exhibited diagrams showing the periods of night at which certain British Lepidoptera were active as indicated by captures at a light trap at Rothamsted Experimental Station during 1933. The light trap was fitted with eight killing bottles which were changed by clockwork at regular intervals during the night. It was thus possible to know at what period each insect captured had entered the trap.

Two species of Hemiptera imported on bananas.

Prof. Hale Carpenter exhibited and made remarks upon the following specimens.

Eurydema f. festivum, L. (Pentatomidae), found upon a bunch of bananas in the museum at Oxford, and exhibited alive. Mr. W. E. China, who had kindly identified the specimen, said that the species had a wide distribution in the Palaearctic region, extending through Middle and South Europe to Kashmir and China, and southwards to North Africa and the Canary Isles. Mr. China had kindly allowed him to exhibit a second species (Reduviidae), taken on bananas at Middlesbrough in May, which had been reported upon as follows by Mr. H. G. Barber, of the U.S. Department of Agriculture, Washington.

"We have several specimens of the same species, unfortunately all females, which have been intercepted at several of our southern ports introduced from Central America in cargoes of bananas. I think it is very likely that your specimen came from the same source, rather than from Jamaica. It undoubtedly belongs to the genus *Repipta* and is very probably a new species."

Wednesday, December 6th, 1933.

Professor E. B. Poulton, F.R.S., President, in the Chair.

The Secretary read for the second time the nominations of the Council for Officers and Council for 1934.

Election of Fellows.

The following were elected Fellows of the Society:—John Arnold Charles Greenwood, 33, South Ridgeway Place, Wimbledon, S.W.19; Miss Cecilia Mirèio Legge, M.A., A.R.C.A., The Manchester Museum, The University, Manchester.

Obituary.

The death of Lieut.-Col. C. G. Nurse, a Special Life Fellow of the Society, was announced.

***Argynnis* (*Brenthis*) *dia*, L., recorded from Britain.**

Prof. Hale Carpenter referred to a specimen of *Argynnis dia*, L., which he had exhibited on October 4th. He had since received corroborative evidence from Mrs. Brodie that the specimen had been actually captured by her husband in 1887 during a walking tour through the New Forest, ending up by Christchurch. The data on Mr. Brodie's label attached to the specimen are "near Christchurch, 27.7.87."

Hibernating *Musca autumnalis*, De G., and *Pollenia rudis*, F.

Prof. Carpenter also exhibited specimens of flies found hibernating in great masses in the Archives Department of the Bodleian Library in October last. Samples were twice obtained, giving the following results.

	Musca autumnalis.	*Pollenia rudis.*
♂	178 = 29%	212 = 72%
♀	424 = 71%	83 = 28%

This observation should be compared with a record by Prof. Poulton (1930, *Proc.*, **5** : 46); in the latter case *M. autumnalis* was almost the only species, *P. rudis* being represented by a single specimen. In this instance the sexes of *M. autumnalis* were : ♂♂ 32, ♀♀ 48; a percentage of 60% females.

The preponderance of the ♂♂ of *P. rudis* offered strong contrast.

Beak marks on Butterflies' Wings.

Prof. CARPENTER also exhibited the following specimens.

1. *Euploea unibrunnea heurippa*, Godm., captured by Mr. R. A. Lever on Santa Isabel Isle, Solomon Islands, in February 1933, and presented by him to the Hope Department of the Oxford University Museum. The specimen showed very clear imprints on all four wings, visible on both surfaces, directed from the anal angle of each fore-wing forwards and inwards, just beyond the end of the cell, and reaching the costa.

A similar mark on each hind-wing showed that the four wings must have been seized together in the position of complete rest. The butterfly was uninjured, but the fore-wings were rubbed between the beak mark and the outer edges.

Euploea unibrunnea heurippa, Godm., showing symmetrical marks probably caused by a bird. Imprints of the bills of two species of Kingfisher from the Solomon Islands are shown for comparison. Natural size.

An endeavour had been made to identify the attacker, and Dr. Percy R. Lowe of the British Museum had kindly given every assistance. Tristram's paper (" Birds from the Solomon Isles," 1879, *Ibis*, 3) gave two species of Kingfisher inhabiting the Solomon Islands, *Halcyon sancta*, Vig. and Horsf., common, and a new species, *Ceyx gentiana*, Tristr. Imprints made by pressing the bill of a specimen of each of these on soft paper held between the mandibles showed the former to have been the

more probable assailant, as the character of the mark showed fair correspondence with the print on the wing. Fruhstorfer (Seitz, **9** : 260) says *heurippa* "is fond of the dense woods and is a sluggish butterfly, which is only rarely flushed, and easy to catch." The accompanying figure is from a photograph kindly made by the Imperial Forestry Institute, Oxford.

2. *Brenthis freija*, Thunb., found by Commander J. J. Walker, R.N., in the Rowland Brown collection at Oxford. The specimen bore data "Abisko (Swed. Lapland) 22.vi.1911. R.R.B."

The inner margin of each hind-wing bore, just in front of the anal angle, a very sharply defined mark directed outwards and slightly forwards, longer on the left side, where it measured 5 mm. The breadth at the margin of the wing was barely 2 mm. The under surface bore a similar mark.

A species of beetle new to Britain.

Mr. Donisthorpe exhibited a specimen of *Tychus ibericus*, Motsch. (Pselaphidae), a beetle new to Britain which was taken by him at the roots of a stump in a willow swamp in Windsor Forest, on 20th May, 1933. He pointed out that *T. ibericus* had been wrongly recorded as a British species in 1847, from a colour variety of the common *T. niger*, Pk., taken by Wollaston in the south of England.

He also exhibited a ♂ and ♀ from Rye's collection (given to Rye by Wollaston) lent him by Mr. Midgley of the Chadwick Museum, Bolton, and pointed out how *ibericus* differs from *niger* and its variety in the secondary ♂ characters, etc.

An aberration of *Ornithoptera victoriae rubianus*.

Mr. A. Dicksee exhibited an extraordinary aberration of *Ornithoptera victoriae rubianus*, Roths., from Ranonga, Solomon Islands. He stated that in the few male specimens known the normal colouring of the front wing was a green basal patch extending about a third across the wing, with two green spots near the apex. In one or two specimens there was a third spot below these two; and in one or two a third spot above. In one specimen all four spots were present, and in another there was one spot only.

In the aberration exhibited the green extended over the whole wing, leaving only a black border varying from 5 mm. to 10 mm. wide.

The females also vary a great deal as was shown by the two specimens exhibited. It was considered very strange that this race should be so variable when all the remaining races from the other islands appear to be constant.

Fresh observations by Capt. C. R. S. Pitman, D.S.O., M.C., on the migratory flight of the Nymphaline butterfly *Cymothoe caenis*, Drury, in S.W. Uganda.

The President exhibited 8 male and 2 female specimens of the migrating butterflies recorded by his friend Capt. Pitman in the following extract from a letter written at Mbarara. The two females were male-like. Many other forms of female had been described in previous migrations of *C. caenis* in Uganda.*

* 1928, *Proc. Ent. Soc. London*, **3**: 70–72, 88, where references to the climatic conditions are to be found. See also Miss Vinall's account of the larva and its food-plant in 1930, *Proc.*, **5** : 45, 92, 93.

" 1933, *Oct.* 19.—Just a hasty line to forward you some butterflies which were evidently on passage to-day through Mbarara in S.W. Uganda. It has been very dry for a long time, and this a.m. at 10.30 and subsequently at intervals till 3.0 p.m. we have had terrific rain from the W. and S.W. After the rain, trees and hedges and shrubs throughout the station were absolutely covered with these butterflies. I am sorry that I cannot be more explicit, but even these meagre details will probably be interesting."

The Danaine butterfly *Tirumala petiverana*, Dbl.-Hew., assembling for the night on leafless trees at Kilossa, T.T., E. Africa.

The President said that his friend Mr. C. J. Wainwright had informed him of observations made in 1918 by Mr. H. G. Quilter of the Angel Hotel, North Walsham, Norfolk. He had sent specimens of *Amaurus niavius dominicanus*, Trim., *A. ochlea*, Boisd., and *T. petiverana* to Mr. Quilter, who considered that the last-named was the butterfly he had seen. This was extremely interesting as, so far as he was aware, it was the first recorded observation of sleeping assemblage in this species.

Mr. Quilter had kindly sent him the following interesting account of his experience :—

" After serving in the R.A.S.C. as first-class Warrant Officer on the Somme I was, on returning to England in 1917, sent to East Africa and stationed for a year and a half on Supply Depot at Kilossa on the main line to Tabora. Kilossa being rather notorious for fever we naturally made our living quarters on the higher ground north of the railway, and near a small Military Cemetery which lay at the foot of the hills. It was here that I noticed, an hour after sunrise and an hour before sunset, hundreds upon hundreds of black, light-blue-spotted butterflies flying away and returning, much as the crows do in this country. Observing the direction of their morning and evening flights I went, accompanied by a friend, to the Military Cemetery close to which we found two trees apparently in full leaf while everything around was dried-up and leafless. These on closer inspection proved to be one mass of the black, blue-spotted butterflies, clinging with wings closed in readiness for the night's rest. I had no chance of taking specimens for preservation under those oversea war conditions, but I shall always remember the beautiful insects and the wonderful sight they gave me. Of the three specimens sent *petiverana* is the one which accords with my memory of the butterflies.

H. G. Quilter, S.S.M., late R.A.S.C."

Mr. Quilter added that although the butterflies showed a black ground-colour as they flew in the strong light, on the trees with closed wings they appeared of " a dull brown or a shade lighter than black, through which you could see the blue spots very faintly."

Evidence of insect-food-preference in Fijian and Oriental birds, by Mr. H. W. Simmonds, F.R.E.S.

The President said that his friend Mr. Simmonds had written, 4 June, 1933, in reference to the discussion of 7 Dec., 1932, recorded in our *Proceedings* :—

" The Coconut Moth, *Levuana viridescens* (Zygaenidae), was for 60 years a major pest in Fiji, actually turning the trees brown like fire. It was the subject of

intensive study, and only once was a bird observed apparently to take a larva; yet we have plenty of insectivorous birds. The Zygaenid, *Artona catoxantha*, in Malaya also becomes equally numerous at times, but does not lead to any concentration of birds. Yet even protected abundant species such as *Oecophylla smaragdina*, the Green (or Red) Tree-Ant may have special bird enemies, as in this case a Woodpecker feeds largely upon it, as I have learned from the Curator of the Raffles Museum, Singapore. Again, the Indian Bulbul will attack the wasp *Polistes*, but I have never seen any other bird do so."

Notes on the British species of the genus *Microsania*, Zett. Diptera (Platypezidae).

Mr. J. E. Collin said that in June 1930 when collecting at Blakeney Point (Norfolk) I swept up some specimens of a small Dipteron which were at once recognised as belonging to the above genus then unrecorded as British. In accordance with our knowledge of this genus at that time they were placed in my collection as *Microsania stigmaticalis*, Zett., and were exhibited by me at a meeting of the Entomological Club at Eastbourne in 1931 under that name. This year Mons. A. Collart of Brussels as a result of studying a large number of specimens of this genus captured in Belgium, under the peculiar circumstances noted later, discovered that the three names in the Palaearctic "List" represented good and distinct species, and that they all occurred in Belgium. He returned a pair of my specimens which I sent him at his request as *Microsania pallipes*, Mg., and forwarded a copy of his excellent paper on the genus (1933; *Bull. Mus. Hist. nat. Belg.*, **9**). An examination of my remaining specimens (1 ♂, 2 ♀♀) proved that they included another pair of *M. pallipes*, Mg., and a female of *M. pectinipennis*, Mg. There is also a male of *pectinipennis* in the British Museum collection taken by Dr. F. W. Edwards on the window of a fowl-house at Welwyn (Herts) on 10th July, 1926. I can thus definitely record these two species as British, and there is every reason to believe that the third species (*stigmaticalis*, Zett.) will be found in Britain, if sought when conditions are similar to those under which all three species were found in Belgium.

Until 1921 specimens of *Microsania* were considered great rarieties; but in that year Mons. G. Severin discovered that in various parts of Belgium males could be obtained in hundreds in the immediate vicinity of heath fires, the insects flying even in the smoke and settling on the still hot ground and burnt herbage; in one case they were said to be so numerous as to hinder the work of those engaged in trying to extinguish the conflagration. My own specimens were not obtained under these conditions, but there was a peculiarity about their capture which might deserve to be placed on record. On the day of capture a short sharp shower was followed by a hot sunny period, the marram-grass which I was sweeping dried up quickly after the shower, and I was able to sweep almost as soon as the sun appeared; my first two sweeps produced five specimens of *Microsania* after which not a single specimen could be found.

The attraction of heath fires for some other insects is well known, for instance Coleoptera of the genus *Melanophila* are found under such conditions, but the only other case in the Diptera known to me is that of a rare Empid *Hormopeza obliterata*, Zett., recorded by me in 1918, *Ent. Mon. Mag.*, **54** : 278.

The three species of *Microsania* may be distinguished by the following characters, which are further supported by differences in the male genitalia.

1(2). With a small apical spur to hind tibiae. Costal ciliation more distinct *pectinipennis*, Mg.
2(1). No apical spur to hind tibiae. Costal ciliation less distinct.
3(4). Pubescence blackish, pterostigma blackish . . . . *stigmaticalis*, Zett.
4(3). Pubescence yellowish, pterostigma brown . . . . . *pallipes*, Mg.

Papers.

The following papers were read :

(1) " Two Collembola-collecting Crabronids in Trinidad," by J. G. Myers.

(2) " Contributions to a knowledge of S. African marine Clunionine Chironomids," by A. J. Hesse.

(3) " On the Brush Organs of the male Ermine Moth, *Spilosoma menthastri*," by H. Eltringham.

(4) " The metasternum and pleuron of Heteroptera," by Mrs. M. D. H. Brindley.

(5) " Studies on Ethiopian Simuliidae, Parts 3 and 4," by E. G. Gibbins.

(6) " A study of the genus *Actinoptera*, Rond., in the Ethiopian region," by H. K. Munro.

ANNUAL MEETING.

Wednesday, January 17th, 1934.

Professor E. B. Poulton, F.R.S., President, in the Chair.

Dr. S. A. Neave, Secretary, read the names of the Fellows nominated as Officers and Council for the ensuing year, and announced that they had been duly elected in accordance with the Bye-Laws.

He then read the following :—

Report of the Council, 1933.

In the Centenary year of the Society, perhaps the most notable in its history, the Council is fortunate in being able to report satisfactory progress in its various activities.

A full account of the Centenary celebrations themselves, which took place from 3rd to 5th May, has already appeared in the *Proceedings*, and it is unnecessary to describe them further here. Allusion must, however, be made to the profound gratification with which it was learnt that our Patron, His Majesty the King, had been graciously pleased to command that the Society shall henceforth be known as the Royal Entomological Society of London.

The plans for the arrangements connected with the celebrations were entrusted to a special sub-committee of the Council consisting of Professor E. B. Poulton, Dr. H. Eltringham, Mr. Francis Hemming, Dr. K. Jordan, Mr. R. W. Lloyd, Sir Guy Marshall and Dr. S. A. Neave.

" The Centenary History of the Entomological Society of London," prepared by Dr. S. A. Neave, was published on 24th April, shortly before the celebrations themselves, and copies of it were distributed to all Fellows, as well as to the Delegates.

During the summer of 1933 the 75th anniversary of the foundation of the Swiss Entomological Society was celebrated at Zurich, and the Society was represented on that occasion by Dr. K. Jordan, F.R.S.

During the year the Council have set up a Committee on Generic Nomenclature, and on their recommendation the Council have decided to publish a work entitled " The Generic Names of British Insects." This will be issued in parts, and copies will be distributed free to Fellows, the cost being defrayed from the Meldola bequest.

The close of the present year marks also the end of the distinguished period during which Dr. S. A. Neave has acted as Secretary to the Society. The fifteen years that he has held this office have witnessed a remarkable transformation in the affairs of the Society, and to him belongs a large measure of the credit for these many-sided developments.

Increasing pressure of other work has forced Dr. Neave to tender his resignation, which the Council have only accepted with the greatest regret. They desire

to take this opportunity of expressing their warm appreciation of the many services that Dr. Neave has rendered to the Society, and they are happy to think that, by consenting to serve as President for the coming year, Dr. Neave will continue for some time to take an active part in the direction of the Society's affairs. He has consented also to retain for the present the editorship of *Stylops*.

The Council offer a hearty welcome also to Mr. A. W. McKenny-Hughes, who is succeeding Dr. Neave as Secretary.

Since the last Annual Meeting, one Special Life Fellow, Lieut.-Colonel C. G. Nurse, and the following 5 (15) Fellows have died, or their deaths have been ascertained (the numbers in brackets in this and the following paragraphs indicating the corresponding ones for the previous year) :—T. A. Coward, A. Druitt, E. J. Godfrey, J. J. F.-X. King and C. F. C. Riley.

The following 6 (11) Fellows have resigned :—H. L. Earl, H. T. Fernald, H. L. Gauntlett, G. K. P. Hebbert, W. F. Schlupp and A. Townsend.

The following 6 (19) have been removed from the List of Fellows in accordance with the Bye-Laws, Chapter XVI, Section 3 :—M. F. Bliss, Prof. C. Bolivar y Pieltain, A. N. Burns, Miss A. Castle, T. H. L. Grosvenor and G. Lyell.

During the year 3 Special Life Fellows, W. G. Sheldon, Commander J. J. Walker, and the Rev. George Wheeler, and 40 Ordinary Fellows have been elected. This more than compensates for the losses during the year, and the total result is a substantial increase in the number of Fellows. The Society now consists of 12 Honorary Fellows, 7 Special Life Fellows and 676 Ordinary Fellows.

The meetings have been exceptionally well attended, the average number of Fellows and Visitors at each being 84, an increase of 23 over the previous year.

The two Parts of the *Transactions* for 1933 (Volume LXXXI) were published on 30th June and 30th December respectively. They comprise 15 papers by 16 authors. Of these, 3 deal with Hymenoptera, 2 with Lepidoptera, 2 with Coleoptera, 2 with Diptera, 1 with Rhynchota, 1 with Thysanoptera, 2 with Insect Teratology, 2 with General Entomology and 1 with Migration of Insects. The volume consists of 234 pages, and is illustrated by 22 plates. It is somewhat smaller than the exceptional volumes for the two previous years, this being mainly due to a considerable reduction in the financial assistance from outside sources received towards the cost of its production, and also to the fact that from the funds allotted to it for this year was transferred a sufficient sum to meet the cost of publication in the *Proceedings* of Dr. McAtee's reply to the criticisms of his work published in that journal for 1932. The India Office contributed £30 towards the cost of the plates of Mr. Sharga's paper. Dr. Cockayne paid the cost of the plate illustrating the paper by himself and Mr. C. N. Hawkins; and Mr. Deshpande and Mr. Hawkins £5 each towards the cost of the plates in their respective papers.

Partly for the reason given above, but largely because it contains a full account of the Centenary meeting and celebrations, the volume of the *Proceedings* will, on the other hand, be the largest on record. It will consist of about 180 pages, illustrated by 2 plates and some text-figures. The cost of the plates and of the printing of the Addresses presented at the Centenary meeting has been defrayed from the Centenary Fund, and Professor E. B. Poulton made a donation of £5 towards the extra cost of the discussion on " Protective Adaptation."

The second volume of *Stylops* consists of 272 pages and is illustrated by 5 plates and numerous text-figures. It comprises 62 papers by 51 authors. Of these, 21 deal with Coleoptera, 12 with Hymenoptera, 8 with Lepidoptera, 7 with Diptera, 5 with Hemiptera, 3 with Odonata, 2 with Thysanoptera, 1 with Orthoptera, 1 with Trichoptera, 1 with Psocoptera, and 1 with Thysanura.

Professor E. B. Poulton defrayed the entire cost of the two plates illustrating his article on *Charaxes ansorgei*, Mr. J. F. Marshall and Dr. F. Marsh the cost of the blocks of the plates illustrating their papers, and Mr. G. H. Corbett made a donation towards the cost of the illustrations of his paper.

Much of the detailed work of the Society's business has been carried out by a Finance and Housing Committee, under the Chairmanship of Mr. R. W. Lloyd, a Publication Committee under that of Mr. N. D. Riley, and a Library Committee under that of Dr. K. Jordan, and the thanks of the Council are again due to those Fellows who have served on these Committees.

The Library, both as regards its organisation and the growth of its contents, has continued to make good progress during the year.

The most important single addition is that of a complete copy of Cyrilli : *Entomologiae Neapolitanae*, 1787, generously presented by Mr. R. W. Lloyd. This contains 4 plates with their explanations that are additional to the 8 found in most copies. Another interesting accession is a copy of the *Transactions of the Entomological Society of Kiev*, this being the only recorded copy in this country.

Considerable progress has been made with the arranging and cataloguing of the collection of separata, 7,200 having now been dealt with. The use of the Library by Fellows continues to grow, and there is a satisfactory increase in the number that have borrowed books, viz. :—382 (348). In addition several books not in the Library were obtained for Fellows from the National Central Library, and some books were sent on loan to that organisation in return.

The Honorary Secretary of the Committee for the Protection of British Insects reports that its sub-committee and that of the Committee of Management for Wicken Fen met on the Fen in May. The question of summer-cutting portions of the Sedge Fen, as recommended by the representatives of the Society, was discussed and each portion inspected. Certain plots were selected for experimental cutting, parts of each being left as controls. It was decided that one side only of the new droves should be mown in the summer instead of the whole width and that the cutting of the main drove should be deferred until the autumn. The total acreage selected for cutting in 1933 amounts to approximately 16 acres.

The recommendations of the two sub-committees were duly approved by the Committee of Management at the annual meeting held at Cambridge in July.

The cutting has been carried out and a record will be kept of the date on which the cutting took place. It is hoped that this will, in the future, provide data that should be of assistance in deciding how best to treat each plot, taking into consideration the insects and plants inhabiting it. A wet or dry summer following the cutting has a considerable effect on the second growth. Though the area cut this year is small, your Committee feel that a start has been made at last. They hope that, as time goes on, and as the beneficial effects of summer-cutting become

apparent, it will be possible to cut larger and larger areas each season. It was arranged that the two sub-committees should meet on the Fen each spring to inspect the effect of the previous year's cutting and to make further recommendations.

Your Committee again subscribed towards the protection of *Maculinea arion*, L., in N. Cornwall. The season was favourable to this butterfly, and it was seen in increased numbers in the reserved area. *Lycaena dispar batavus*, Oberth., appeared in large numbers both at Wood Walton Fen and Wicken Fen. No attack by parasites was noticed in either locality. No specimens bred in captivity were liberated, and the butterfly seems to be able at the present time to survive without this assistance, provided that the environment is maintained in a satisfactory condition. *Lycaena dispar rutilus*, Werneb., was not reported from Norfolk this season, but it does not follow that it has disappeared.

Your Committee was able to be of assistance in helping to protect a rare Dragonfly in a locality in Surrey in which it had not previously been recorded.

In conclusion, it may be reported that your Committee is maintaining close touch with such organisations as the National Trust and the Society for the Promotion of Nature Reserves, which are interested in the preservation of the Insect fauna of the country.

The Report was adopted on the motion of Fleet-Paymaster T. Bainbrigge Fletcher, seconded by Mr. R. W. Lloyd.

Mr. Francis Hemming, Treasurer, then read the following :—

Treasurer's Report.

In my report for last year, I observed that in times of general economic depression like the present, institutions such as ours are particularly vulnerable, depending, as they do, for the greater part of their income on subscriptions and on the sale of publications.

It is therefore satisfactory to be able to record this year a substantial improvement in the position as regards subscriptions. The increase under the head " admission fees " is also very satisfactory.

The income from the sale of the Society's *Transactions* and *Proceedings* shows, however, a further shrinkage. This is due in part to the fact that in the current year the Society has not received such substantial contributions towards the cost of its publications as in previous years, and in part to the reduction in the contribution from the General Fund necessitated by the general financial position. The publications this year have, therefore, been considerably lower-priced than usual, with the result that though the volume of orders received shows but little decline, the receipts from sales show a considerable drop. If the present indications of a return to general prosperity are maintained, it should be possible gradually to increase the annual contribution from the General Fund towards the cost of the publications and thus in time to secure an increased income from sales.

Turning to the expenditure side of the accounts, it will be seen that as a result of economical administration, the house and office expenses, despite their natural tendency to rise, are at substantially the same level as in previous years. Such small increase as has occurred is due in part to an increase in the annual transfer

from the General Fund to the Repairs to Premises Fund, and in part to miscellaneous items of expenditure indirectly attributable to the centenary.

The cost of the centenary celebrations has been almost entirely defrayed from the Centenary Fund. The receipts of the Fund have been derived from donations, from the sale of the Centenary History, and from bank interest. Since the opening of the fund in 1932, these have amounted in all to the sum of £578 15*s.* 8*d.*, which includes a small grant from the General Fund amounting to £16 10*s.* 6*d.* From the Fund there has been met the cost of the actual celebrations and of the printing of the Centenary History of the Society and of the portion of the annual *Proceedings* that record the celebrations.

The position as regards *Stylops* differs but little from that of a year ago. The net expenditure from the General Fund in the current year was some £30 less than in 1932, but this was due to economies effected in the production of the journal, the receipts from sales being almost unchanged. In view of the difficulties of the time at which *Stylops* was launched, the present position is, I think, as satisfactory as could be expected.

The accounts for the year 1933 show an excess of income over expenditure of £151 5*s.* 7*d.* as compared with one of £52 19*s.* 7*d.* in the year 1932. Turning to the balance sheet, it will be seen that the excess of liabilities over assets, which amounted to £119 3*s.* 7*d.* on 31st December, 1932, has this year been transformed into an excess of assets over liabilities amounting to £32 2*s.* 0*d.*

On the whole, therefore, from the financial point of view, the year 1933 may be regarded as having been one of sound, if modest, progress. The financial difficulties that have beset the Society throughout the period that I have held the office of Treasurer, have at length been overcome, and, given a reasonable degree of recovery in the general financial situation, it is permissible to hope that the scene is now set for further developments in the activities of the Society.

The Report and Accounts were adopted on the motion of Prof. G. D. Hale Carpenter, seconded by Dr. E. A. Cockayne.

The President then read his Address, and at its conclusion a vote of thanks to him, coupled with the request that it might be printed in the *Proceedings*, was moved by Dr. S. A. Neave, and carried unanimously.

A vote of thanks to the Officers for their services during the year was then passed on the motion of Dr. H. Eltringham, seconded by Mr. N. D. Riley, and carried unanimously. Dr. S. A. Neave and Mr. Francis Hemming briefly replied.

THE ROYAL ENTOMOLOGICAL SOCIETY OF LONDON.

TREASURER'S STATEMENT OF INCOME AND EXPENDITURE for the Year ended December 31st, 1933.

(Presented at the Annual Meeting, 17th January, 1934.)

GENERAL FUND.

INCOME.

1932.			£	s.	d.	£	s.	d.
£								
		To subscriptions—						
43		received in advance for 1933 ...	44	1	9			
1,158		received in 1933 for 1933	1,182	9	9			
40		received in 1933 for previous years	73	10	0			
1,241			1,300	1	6			
135		*Less* subscriptions in arrear at 31st December, 1932	50	0	0			
1,106			1,250	1	6			
50		*Add* subscriptions in arrear at 31st December, 1933—valued at ...	75	0	0			
1,156						1,325	1	6
44		,, admission fees				122	15	5
		,, publications—						
480		sales	364	3	11			
179		donations towards cost	56	17	6			
659						421	1	5
3		,, interest on deposit at bank				2	5	0
55		,, dividends on investments (gross) ...				55	2	8
250		,, rents from sub-tenants				250	0	0
		,, contributions by sub-tenants towards						
233		house expenses				230	3	0
14		,, miscellaneous				3	12	0
£2,414						£2,410	1	0

EXPENDITURE.

1932.			£	s.	d.	£	s.	d.
£	£							
		By House expenses—						
222		wages	235	10	3			
94		fuel, gas and electric light	94	5	6			
35		insurance and water	34	9	10			
50		repairs fund—transfer	80	0	0			
45		miscellaneous	21	2	11			
446						465	8	6
		,, office—						
615		salaries	637	14	1			
67		printing and stationery	54	15	5			
26		postages	46	7	9			
21		audit fee	21	0	0			
	25	superannuation ... 25 5 6						
	10	*less* employees' contributions 11 2 0						
	15		14	3	6			
		furniture and equipment	3	4	6			
15		miscellaneous	30	0	11			
759						807	6	2
		,, library—						
168		library fund transfer	100	16	5			
		furniture	38	18	0			
168						139	14	5
706		,, cost of publications				584	15	3
355		,, "Stylops" cost of printing, &c. ...	317	1	4			
	90	*less* subscriptions ... 92 10 9						
	98 8	donations ... 4 10 0						
257			97	0	9	220	0	7
25		,, donation to Zoological Record ...				25	0	0
		,, contribution to Centenary fund ...				16	10	6
		,, excess of income over expenditure carried to Balance Sheet				151	5	7
53								
£2,414						£2,410	1	0

STATEMENT OF INCOME AND EXPENDITURE for the Year ended December 31st, 1933.

WESTWOOD BEQUEST FUND.

1932.	Income.	£ s. d.	1932.	Expenditure.	£ s. d.
£ 7	To interest on Birmingham Stock	7 3 8	£ 7	By income for the year, carried to Balance Sheet	7 3 8

HAMILTON DRUCE BEQUEST FUND.

1932.		£ s. d.	1932.		£ s. d.
£ 44	To interest on New Zealand Stock	43 16 6	£ 44	By transfer to Library Fund	43 16 6

LIBRARY FUND.

1932.			£ s. d.	£ s. d.	1932.		£ s. d.	£ s. d.
£	£				£	£		
	44	To transfer from Hamilton Druce Bequest Fund—interest on New Zealand Stock	43 16 6			209	By expenditure on books	119 4 0
	168	,, transfer from General Fund	100 16 5			42	,, binding, repairs and insurance	77 14 9
	1	,, donation by R. W. Lloyd, Esq.	8 0 0		251	—		196 18 9
213	—	,, miscellaneous	—					
				152 12 11				
38		,, excess of expenditure over income, carried to Balance Sheet		44 5 10				
£251				£196 18 9	£251			£196 18 9

REPAIRS TO PREMISES FUND.

1932.		£ s. d.	1932.		£ s. d.
£ 50	To transfer from General Fund	80 0 0	£ 7	By expenditure on repairs	19 13 2
			43	,, excess of income over expenditure, carried to Balance Sheet	60 6 10
£50		£80 0 0	£50		£80 0 0

CENTENARY FUND.

1932.		£ s. d.	£ s. d.	1932.		£ s. d.
£ 264	To donations	288 12 7		£ 264	By receipts for year carried to Balance Sheet	314 7 1
	,, interest on deposit	1 3 0				
	,, sales of History of Society	8 1 0				
	,, contribution by General Fund	16 10 6				
			314 7 1			
£264			£314 7 1	£264		£314 7 1

BALANCE SHEET, December 31st, 1933.

GENERAL FUND.

Liabilities.	£ s. d.	£ s. d.	Assets.	£ s. d.	£ s. d.
To sundry creditors	405 4 3		By sundry debtors—		
,, subscriptions in advance	48 6 7		subscriptions valued at	75 0 0	
		453 10 10	admission fees	18 18 0	
,, excess of assets over liabilities :			publication sales	127 10 2	
excess of income over expenditure for year to date	151 5 7		rent and contributions to house expenses	131 9 10	
Less excess of liabilities over assets at 31st December, 1932	119 3 7		sundries	39 10 2	
		32 2 0			392 8 2
			,, payments in advance		15 16 10
			,, unsold copies of publications	(Not valued)	—
			,, cash : at Bank	33 11 10	
			in hand	43 16 0	
					77 7 10
		£485 12 10			£485 12 10

WESTWOOD BEQUEST FUND.

	£ s. d.	£ s. d.		£ s. d.
To excess of assets over liabilities at 31st December, 1932	257 3 8		By £239 12*s.* 4*d.* Birmingham Corporation 3% Stock 1947 at cost	250 0 0
Add income from investment for year to date ...	7 3 8		(value at date £203 13*s.* 4*d.*)	
		264 7 4	,, cash at Bank	14 7 4
		£264 7 4		£264 7 4

HAMILTON DRUCE BEQUEST FUND.

	£ s. d.	£ s. d.		£ s. d.
To excess of assets over liabilities at 31st December, 1932	1,000 0 0		By £1,095 15*s.* 6*d.* New Zealand 4% Stock 1943/1963 at cost ... ... (value at date £1,117 13*s.* 9*d.*)	1,000 0 0
		£1,000 0 0		£1,000 0 0

LIBRARY FUND.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To sundry creditors		16 6	By library furniture and fittings	(Not valued)	
,, cash at Bank overdrawn	28 2 3		,, library books (valued at £10,000)		
			,, excess of liabilities over assets :		
			excess of expenditure over income for year to date	44 5 10	
			Less excess of assets over liabilities at 31st December, 1932	15 7 1	
					28 18 9
		£28 18 9			£28 18 9

BALANCE SHEET, December 31st, 1933.

REPAIRS TO PREMISES FUND.

Liabilities.	£ s. d.	£ s. d.	Assets.	£ s. d.
To excess of assets over liabilities at 31st December, 1932	54 10 0		By cash at Bank	114 16 10
Add excess of income over expenditure for year to date	60 6 10			
		114 16 10		
		£114 16 10		£114 16 10

HOUSING FUND.

	£ s. d.		£ s. d.	£ s. d.
To excess of assets over liabilities at 31st December, 1932 ...	£13,417 3 4	By freehold premises, 41, Queen's Gate, at cost	6,250 0 0	
		„ cost of New Meeting Room Scheme	7,167 3 4	
				13,417 3 4
	£13,417 3 4			£13,417 3 4

COMPOUNDING FUND.

	£ s. d.		£ s. d.	£ s. d.
To excess of assets over liabilities at 31st December, 1932 (representing estimated liability of Fund at that date—subject to revision quinquennially.)	1,185 0 0	By £1,354 2*s.* 2*d.* 2½% Consols valued at 6th March, 1929	737 19 9	
		„ £532 3*s.* 5*d.* 4% Consols valued at 6th March, 1929 ... (value at date £1,583 8*s.* 8*d.*)	447 0 3	
				1,185 0 0
	£1,185 0 0			£1,185 0 0

CENTENARY FUND.

	£ s. d.	£ s. d.		£ s. d.
To excess of assets over liabilities at 31st December, 1932	264 8 7		By unsold copies of History of Society transferred to General Fund (not valued)	—
Add receipts for year to date	314 7 1			
	578 15 8			
Less expenditure:	£ s. d.			
Centenary celebrations	243 15 7			
History of Society	245 0 1			
estimated cost of Centenary portion of *Proceedings*	90 0 0			
	578 15 8			
		—		
		£ —		£ —

GENERAL RESERVE.

	£ s. d.		£ s. d.
To excess of assets over liabilities as at 31st December, 1932	450 0 0	By cash at Bank on deposit	450 0 0
	£450 0 0		£450 0 0

(Signed) Francis Hemming, *Treasurer.*

We have examined the above Balance Sheets and Accounts with the Books and Vouchers of the Society and certify them to be correct. The Solicitors have certified to us that they hold the deeds of 41, Queen's Gate for safe custody on behalf of the Society, and we have verified the Investments and Bank Balances.

23, *Queen Victoria Street,*
London, E.C. 4.
10*th January*, 1934.

(Signed) W. B. Keen & Co., *Chartered Accountants.*

THE PRESIDENT'S ADDRESS.

Ladies and Gentlemen,

During the past year our Society has lost by death six Fellows, one of whom, Lt.-Col. C. G. Nurse, was a Special Life Fellow.

The loss of T. A. Coward, F.Z.S., is a great blow to British Natural History. His interests as a field naturalist were unusually wide and no lover of animals appealed to him in vain. I well remember the great assistance he gave to me in the study of " British Insectivorous Bats and their Prey " (*Proc. Zool. Soc.*, **1929 :** 277), a paper in which five of his publications are quoted; and ever since its appearance he has, from time to time, sent me additional notes for a future publication on the same subject. Although Coward had been one of our Fellows for 20 years, his main interest was Vertebrate Zoology. His " Birds of the British Isles and their Eggs," 1919, has been described as " a household word among amateur ornithologists, which has done more to promote and encourage the intelligent study of birds in Great Britain than any other work of our time." *

Alan Druitt, a Fellow of the Society from 1924, was keenly interested in British Lepidoptera, especially the Lycaenidae and the Irish race of *Epinephele jurtina*. He also collected tropical species during a trip up the River Amazon. Druitt was one of the first twelve members of the Hampshire Entomological Club and took a prominent part in its expansion into the flourishing Entomological Society of the South of England over which he presided in 1928 and 1932. He had delivered his Presidential Address on 28 Jan. 1933, only twelve days before his sudden death due to thrombosis. This brief notice of Druitt's entomological interests I owe to the kind help of Mr. W. Parkinson Curtis, F.R.E.S.

E. J. Godfrey, elected a Fellow in 1914, became a science master at Suan Kularb College, Bangkok, Siam, in 1908, and at once devoted all his available time to the careful study of the Rhopalocera, making eventually the most complete collection ever known from that country and publishing valuable lists of species and subspecies in the *J. Nat. Hist. Soc. Siam.* This Siamese Society, founded in 1913, owes much to his influence and, for some years, to his care in editing its publications. A more complete account of his entomological work will be found in the Obituary Notice printed in the *Entomologist* for September 1933, to which I am indebted for this slight record of a keen follower of our Science whose work will endure.

We have also to regret the loss of J. J. F.-X. King, a Fellow since 1889 and well known as an energetic and successful collector of British insects, especially

* *Nature*, **131** : 297, 4 Mar. 1933.

from the Scottish Highlands, the Lake District and Ireland. He presented all his collections of insects to Glasgow University, where he held, until recently, the Professorship of Art. He will be greatly missed by his many friends.

Lt.-Col. C. G. Nurse, elected a Special Life Fellow in 1932, became a Fellow in 1895. He was a keen entomologist who began to collect butterflies and moths when a boy at school, Indian Lepidoptera in 1892 and Indian Hymenoptera in 1897, contributing many papers on the latter Order to the Bombay Natural History Society and articles on Diptera and Neuroptera to the *Entomologist*. He also wrote on the birds of India and discovered a new snake at Aden. A large number of species of Hymenoptera, Lepidoptera Heterocera, and Diptera were described from his Indian and Arabian collections. He also discovered two Hymenoptera, two Diptera, and one Neuropteron new to science in Britain. In 1920 he presented his whole collection of Indian Hymenoptera, over 10,000 specimens, to the British Museum. The material from which this brief summary of Col. Nurse's fruitful entomological career has been written was published in *The Times* of 7 November, 1933.

I have been unable at present to obtain a record of the entomological interests of C. F. C. Riley, of the Dept. of Zoology, University of Manitoba, Winnipeg, Canada, who became a Fellow in 1924.

I will ask you to rise for a few moments in memory of our fellow-workers in Entomological Science.

The great events of the past year, the greatest in the history of our Society, the Centenary and the gracious consent of His Majesty to the dignity then conferred upon us and signalised in our title, are fully recorded with grateful thanks, in the *Proceedings* of 6 December, 1933. It will be, I am sure, a special gratification to the Fellows that Dr. S. A. Neave, who laboured so hard and so successfully for the Centenary Celebrations, should be the President elected in the first year of our second century.

The discussion on the " Protective Adaptations of animals—especially insects " which was held on 7 December, 1932, was recorded in 1933, *Proceedings*, **8** : 25–96, published on 21 April, 1933, and may therefore be treated as a feature of the past year. Extracts from letters received from three Fellows are of much interest in relation to the subject, and are therefore printed below where they will be not far removed from the report of the discussion.*

Mr. H. B. Cott wrote on 13 February, 1933 :—

" I have now got well on with the food of *Hyla arborea* in Gran Canaria and Gomera. This paper will be supplementary to the Zambesi Frog report. Again I have found that aposematic prey are scarce.

" Just before the term started, I concluded a series of experiments with toads

* Dr. McAtee's reply to statements made in the discussion was communicated to the meeting on 4 Oct. 1933, and appeared in Pt. II of the *Proceedings*, issued 30 Dec. 1933. Comments on a reply which has only become available at so recent a date are therefore deferred.

to prove whether or not these creatures can learn to recognise distasteful insects. A series of thirty-three toads were placed, severally, upon the landing-stage of an active bee-hive, and allowed to feed on the bees. The toads were starved for a week before the experiment, and given no other food during its progress. Each toad was placed on the stage twice on each day for a week. The results which were obtained have turned out to be most interesting. Here are some of the main figures :—

" 1. On the seven consecutive days the *number of bees eaten* was as follows :— 45, 41, 18, 10, 8, 3, 0.

" 2. On the seven consecutive days the *number of toads* which ate bees was as follows :—26, 16, 11, 6, 5, 3, 0.

" At the conclusion of this experiment the toads were fed on meal-worms and most of them ate well and were very hungry. I then rested the toads for a fortnight, during which they were again starved, and repeated the whole experiment, obtaining clear proof that the lesson was partly remembered, seven of the toads refusing to touch the bees throughout, and the remainder learning to avoid them much more quickly than before.

" In view of the ideas of some herpetologists that Anura feed indiscriminately, and go for pretty well anything that moves and happens to be of convenient size, I am very glad to have this evidence, which seems to support the evidence of discrimination given in my account of the stomach contents.

" 21 *February*.—I may say that I have kept a careful record of the *behaviour* of the toads, and of the occasions (as far as it was possible to observe) when the animals were stung either externally or internally. Although many toads were badly stung inside the mouth or on the tongue, on no occasion was a bee *ejected* once it was taken into the mouth, in spite of the most marked signs of discomfort. Deglutition is complete. I mention this as it is possible to argue that the absence (relative) of aposematic insects in the stomachs of wild batrachians is simply due to ejection, rather than to discrimination and avoidance, as I believe. This point I mentioned on p. 524 of my Zambesi Frog paper (*Proc. Zool. Soc.*, **1932**)."

I may add that the behaviour of *Lacerta viridis* was exactly as Mr. Cott describes. When hungry, these lizards always swallowed the common wasps offered to them, in spite of signs which every observer, except Dr. McAtee, would have recognised as indications of discomfort.

Dr. F. Morton Jones in a letter to Prof. Hale Carpenter, wrote 23 Oct. 1933, in reference to his experiments on the African Acridian *Dictyophorus laticinctus* * :—

" I am reminded of similar observations upon two N. American species (Taeniopodae, *Romalea microptera* and *Taeniopoda eques*). See Hebard 1925, *Trans. Amer. Ent. Soc.*, **51** : 5, 11. These are large, clumsy, gaudily-coloured insects, the former always and the latter often incapable of flight; and both exhibit the pouring out of distasteful secretions, accompanied by a hissing sound, when disturbed. With the former I have been making some bird-feeding experiments which indicate its recognition and refusal by several species of insect-eating birds. *Romalea*, in its early stages, has the habit of feeding and sleeping in

* Hale Carpenter and E. B. Ford, *Mimicry*, p. 94, Lond., 1933.

massed assemblages, thus increasing its conspicuousness while the individuals are small."

The following passage is quoted from a letter which, written 28 Nov. 1933 by Mr. T. H. E. Jackson, in reference to the discussion on 7 Dec. 1932, arrived by air-mail from Kitale, about five weeks ago :—

" I cannot see how anyone who has studied insects in the field can doubt the theory of Mimicry, though I think a doubter would be far more easily convinced if he collected in a tropical country such as this. If it is not enough to see insects in a drawer, it is certainly enough to catch them oneself. We took, in one small patch of forest in Uganda, 5 distinct varieties of *Pseudacraea eurytus* mimicking *Planema tellus eumelis, epaea paragea, poggei, macarista,* and a black-and-white female, probably of *macarista,* and though all are good mimics, even in a drawer, in the field they are perfect. The flight of the black-and-white females of *Ps. eurytus* is not only quite unlike that of a *Pseudacraea* but also quite unlike that of its own males. Another case is the ♀-f. *peculiaris* of *Papilio cynorta* : two were taken, both as *Pl. epaea paragea,* of which we were collecting a series, and only discovered our mistake after removing the mimics from the net."

Two important memoirs which appeared during the past year have a direct bearing upon the discussion. The first of these, which I owe to my friend the Rev. F. C. R. Jourdain, is the outcome of three years of laborious research devoted by Dr. H. N. Kluijver to the biology and ecology of the starling.* It is beyond the scope of this address to do more than briefly indicate a few of the recorded observations, but I have added in an appendix (p. 14) an abstract of the author's summary, which is written in English, and also of his tabular statement of insect prey brought to the young by the parent birds of two colonies nesting in boxes near Wageningen, Holland. During the years 1929, 1930 and 1931, insects to the number of 16,484 were removed with forceps from the gullets of the nestlings, prevented from swallowing by means of an aluminium collar (harmless if worn only 4 hours a day), or from the nest if rejected by young. These insects were found in 1112 food-samples, 448 of which were collected immediately after the departure of the parents. The remaining 664, collected after the young had worn the collars for an hour or more, were less complete because some of the prey had been rejected by the nestlings and then taken by the parents.†

The author's conclusion that " the starling does not hunt a special insect-species, but . . . usually catches what it can get easiest with its instinctive hunting-method " (p. 138) is entirely justified by his tabular statement, but this does not conflict with another inference -that certain insects are almost or entirely neglected. Remembering the number of insects, the extent of the territory of the chief Colony, A, ‡ which rose to about 100 acres in 1931, and the three years over

* Kluijver, H. N. " Bijdrage tot de Biologie en de Ecologie van den Spreeuw (*Sturnus vulgaris vulgaris* L.) gedurende zijn voortplantingstijd." A thesis submitted for the Degree of Doctor of Agricultural Science, by order of the Rector-Magnificus of the Agricultural High School, Wageningen. Also published as " Verslagen en Mededeelingen van den Plantenziekten-kundigen Dienst te Wageningen," no. **69,** 146 pp. Wageningen, June 1933. H. Veenman & Zonen.

† Information as to the two kinds of samples included in the total, has been very kindly supplied to me by the author.

‡ Shown on the map (p. 5).

which the investigation extended, the fact that 799 Hymenoptera included not a single bee or Vespid and only one Fossorial wasp, *Crabro cribrarius*, L.; the 3307 Lepidoptera, only one *Zygaena filipendulae*, L., and two *Euchelia jacobaeae*, L.; the 4490 Coleoptera, only two Coccinellids belonging to different species; also that the Hemiptera (Heteroptera and Homoptera), totalled only 17; while but two *Forficula auricularia*, L., were present contrasted with 765 Orthoptera, including 565 larvae and imagines of the Acridian *Stenobothrus viridulus*, L.—all these facts point unmistakably to preferences and discrimination. We also arrive at another equally interesting conclusion,—that these abundant and powerful birds, although they nearly always neglect stinging insects and certain species known to be distasteful to some insect-eaters, nevertheless attack and carry off great numbers of other abundant and conspicuous species, such as the moth *Stilpnotia salicis*,* L. (596 of all three stages), the Malacoderm beetle *Telephorus fuscus*, L. (1392) and the Galerucid beetle *G. rustica*, Schall. (1323 larvae and imagines).

Arresting numbers among the 7097 Diptera are 1693 larvae of *Tipula paludosa*, Mgn.; 118 *Beris vallata*, Forst., all taken to late or second broods in 1929; also 2276 *Rhagio* [*Leptis*] *scolopaceus*, L.; and 852 *Scopeuma* [*Scatophaga*] *stercoraria*, L., all but 50 taken to the first broods.

A sheet of notes accompanying Dr. Kluijver's thesis includes three, of which translations are printed below :—

III. A knowledge of the analyses of the stomach contents of wild birds is insufficient for judging their economic importance.

IV. By his quantitative investigations of the contents of bird stomachs, McAtee has not convincingly shown that so-called "protective adaptations" are of no importance (Smithson. Misc. Coll., **85**, No. 7, 1932).

V. The occurrence of insect outbreaks in our [Dutch] forests can be greatly hindered by an abundance of insect-eating birds. This can, in our opinion, be obtained by the establishment of artificial nesting places.

The second memoir,† to which my attention was directed by my kind friend Dr. Neave, describes the results of a careful investigation into "the distribution of mammals inhabiting the Tularosa Basin of southern New Mexico, particular attention being paid to the mammals of an area of white sand dunes and of a black lava flow of recent origin." These two areas "lie in close proximity in the center of the desert plain which forms the lower part of the basin," the climatic conditions being very similar. The colour resemblance to these areas was restricted to those mammals which tended to be isolated on them, and the colours of the mice persisted when they were removed to dissimilar environments. F. B. Sumner's researches on the inheritance of similar colours in mice of the genus *Peromyscus* lead to the inference "that the characters of the mice of the Tularosa Basin are likewise inherited." Colour appears to be the only physical feature of the environment which is correlated with the colours of the animals. "As it is improbable that the color of the background can directly affect the color of the mammals which live upon it, it does not appear probable that the colors of the

* 1932 (1933) *Proc. Ent. Soc. Lond.*, **7** : 83 and footnote.

† "Concealing Coloration among some Desert Rodents of the Southwestern United States," by Seth B. Benson. Univ. Calif. Publ. Zool., **40**, No. 1 : 1–70, pls. 1–2, 8 text-figs., 13 June, 1933.

races are due to the direct action of any one of the environmental factors." . . . " The extremely wide range of variation present in some of the races inhabiting these special areas is probably due to the fact that the barriers . . . are not impassible, . . . thus allowing 'normal' individuals from the surrounding area to intermingle and interbreed with the peculiar races. It is possible, however, that the wide range of variation may mean that selection has not yet established a constant race." The final paragraph of the author's " Summary and Conclusions " (pp. 63, 64), briefly abstracted above, is as follows :—

" The presence of this situation, and of similar situations in other areas which are nearly white or black in general color, indicates that the color of the background, through natural selection, may be an important factor in determining the color of mammals."

Concerning the general problem of the development of colour in desert races the author concludes that " certainly the extreme views expressed by McAtee (1932) * and Buxton (1928) † are not justified on the basis of the present evidence. The latter wrote (*op. cit.*, p. 170) that no progress could be made in solving the problems of the colors of desert animals 'until we rid ourselves of our belief in protective coloration, at any rate so far as it is applied generally to desert animals' " (p. 62).

The necessary limitations imposed upon the writer of an Annual Address prevent any further reference to this most interesting paper with its beautiful coloured plate, but owing to the kindness of our Fellow Dr. F. Morton Jones, a copy has now been added to the Library.

The observations and conclusions of H. Lyster Jameson ‡ on a pale form of the Common Mouse found by him in 1895 on sandhills near Dublin are confirmed by the above memoir. These sandhills stretch along the coast for about 3 miles from Clontarf to Sutton, on the north side of Dublin Bay, and are separated from the mainland by a tidal channel averaging ¼ mile wide at high water, and by extensive mud flats and a narrow strip of water about 20 yards wide, at low tide. The island is, however, connected with the mainland by a bridge and a breakwater. The mice, which were very numerous, showed every gradation between the pale sand-like forms and the common grey mouse. The author concluded that their excessive abundance followed from the absence of terrestrial enemies on the island and that the evolution of the pale colour was due to selection by the Short-eared Owl and by numerous hawks which " pick out the darker mice. The very scanty cover, and the probability that the mice have to travel some distance for their food over bare sand, make the dangers to dark and conspicuous mice much greater." A careful study of maps and all available records led the author to believe that the island first came into existence between 1775 and 1800, and that the evolution—still far from complete—of this pale local race, had been accomplished in from 100 to 125 years.

There is one other memoir to which I feel bound to direct your special attention, although it appeared in September 1932 and thus slightly preceded the year during

* Smithson. Misc. Coll., **85** (7) : 1–201.

† *Animal Life in Deserts*, Lond., pp. v + 176.

‡ " On a probable Case of Protective Coloration in the House-Mouse (*Mus musculus*, Linn.), 1898, *J. Linn. Soc.* (*Zool.*), **26** : 465–473, pl. 30.

which I have had the honour to occupy this Chair. I refer to Prof. Jacobus C. Faure's important work * describing his experiments on South African locusts.

No more arresting pronouncement has ever originated from the science of Entomology than that made by B. P. Uvarov † when he stated his conclusion that the locust swarms which had terrorised and mystified mankind since the dawn of history, and probably ever since that early stage in human development when our ancestors first began to grow and to rely upon crops for their food—that these desolating and incalculable swarms were the migratory phase of a solitary grasshopper developed under the stimulus of overcrowding and therefore, given sufficient knowledge, no longer incalculable and, we may hope in the not distant future, no longer a terror.

It is a splendid thing to have proved this far-reaching theory experimentally, and this Prof. Faure has done by transforming the solitary grasshopper (the phase *solitaria*) into the migratory locust (the phase *gregaria*), in the South African species *Locustana pardalina*, and *vice versa*; also, at present less completely, in other species. The investigations and great expense of printing and illustration were generously supported by the Carnegie Corporation of New York by means of a subsidy administered by the Research Grant Board of the Union of South Africa. The striking differences between the solitary and gregarious migratory stages of four species are illustrated in coloured plates ‡ prepared from the beautiful drawings of Prof. A. J. T. Janse, D.Sc., F.R.E.S. In addition to the coloured plates a large number of excellent photographs of the phases, including the results of many experiments, are reproduced on plates xx–xxiii, xxvi–xxxiv, while types of the country and veld vegetation in the permanent breeding-grounds of *L. pardalina* are illustrated on xxiv, xxv, and the out-door laboratory at the University of Pretoria, on xxxv, with the cages and other apparatus employed in the experiments on xxxvi–xxxviii. The map facing p. 388 shows the permanent habitat in 1915–1931 of *L. pardalina*, phase *solitaria*, the range of its invasions in 1906–1926, and the areas where incipient swarms were destroyed in 1928–1931. The preparation of the plates and details of publication must inevitably have thrown an immense amount of work on the editors of the Bulletin, especially Dr. Neave, who has earned the gratitude of every follower of our science.

In addition to the main result of these most important researches, other experiments upon the power of individual colour-adjustment are of great interest.

The author's conclusion (p. 365) that " locustine," the mainly cuticular, black coloration of the *gregaria* phase, passes into the yolk, is absorbed by the embryo and thus " finds its way into the cuticula to produce the black characteristic of

* " The Phases of Locusts in South Africa," 1932, *Bull. Ent. Res.*, **23** : 293–405, pls. xiv–xxxviii and Map.

† 1921, " A revision of the genus *Locusta*, L., with a new theory as to the periodicity and migrations of Locusts," *Bull. Ent. Res.*, **12** : 135–163, figs. 1–8.

1928, " Locusts and grasshoppers : a handbook for their study and control,"—London, Imp. Bur. Entom., xiv + 352 pp., 118 figs., 9 pls.

‡ (1) *Locustana pardalina*, Walk., the " Brown Locust " (pls. xiv, xv, and xix, figs. 58, 59); (2) *Nomadacris septemfasciata*, Serville, the " Red Locust " (pl. xvi); (3) *Locusta migratoria migratorioides*, Reiche & Fairmaire, the " Hairy-chested Locust " (pls. xvii, xviii, and xix, figs. 57, 60–62); (4) *Schistocerca gregaria*, Forskål, the " Migratory Locust " (pl. xix, figs. 53–56). Only the phase *solitaria* was available for experimental work upon (3) and (4), while (2) was not obtained until March 1931, so that but few observations upon it could be included in this memoir.

the first instar," is strikingly similar to the fate of the modified chlorophyll which passes from the larva of *Smerinthus ocellatus*, L., into its pupa, thence into the eggs and finally the young larvae which are green on hatching and therefore before they have had the chance of gaining fresh chlorophyll from the food-plant.*

In repeating experiments on the effect of food devoid of chlorophyll (pp. 360, 631) it would be interesting to test the hoppers with food similar to that supplied to the larvae of *Tryphaena pronuba*, L., † viz. with yellow, etiolated internal leaves, shielded from light as they are in the heart of a cabbage, also with their fleshy midribs alone, with the etiolin at a minimum and buried beneath the surface. In the experiments referred to the larvae were able to obtain their green or brown colour from the etiolated leaves no less than from the green ones, but, when fed upon the midribs alone, became white and maggot-like, although with the addition of cuticular pigments in certain parts (as also in the maggot-form of larva).

In the slight effect of coloured glass and the apparently negligible effect of blinding (pp. 354–56) the results corresponded with those of experiments on the larvae and pupae of Lepidoptera ‡ which moreover suggest that the natural surroundings—local sands and rocks of different colour—would be more effective than artificially painted surfaces. The facts recorded in this valuable memoir prove that there is a conflict of stimuli acting upon the young hoppers when crowded—the stimuli arising from the colours of the ground surface, which produce cryptic resemblance in the solitary phase, and, opposed to these, the stimuli arising as some consequence of crowding. The latter not only overcome the former, which are of course always present, but produce a definite result in the characteristic behaviour and in the warning pattern of orange or yellow and black, so well illustrated by the author on plates xiv, fig. 6; xv, figs. 19, 23; xvi, figs. 31, 32, &c. It may be suggested that it would be very interesting to ascertain whether qualities distasteful to certain insect-eating animals are developed in response to these stimuli —qualities perhaps present in the pigments themselves, or independent but associated with them.

Prof. J. C. Faure's abundant proofs that a power of colour-adjustment is exhibited by the phase *solitaria* increases the interest of the following observations upon other species of Acrididae.

The resemblance of certain South African Acridians to the local surroundings was observed in 1814 and recorded in his MS. catalogue by W. J. Burchell.§ Thus, under the date 21 November, 1814, he wrote a Latin note on the colour of *Xiphocera* (*Lamarckiana*) sp., ? *cinerascens*, Stål, at Zoetemelks River—a tributary of the Kaffirkuils R., about 7 m. S.E. of Riversdale. A translation is as follows :— " The whole body (including the eyes) is coloured like the stones and sand of the locality which it inhabits, and the colour does not alter. It lives in dry stony places, and is sluggish, leaping heavily." That this great naturalist actually experimented is, I think, rendered certain by his statement that the colour does not alter—it may be inferred that he meant " does not alter rapidly "; although the name " *Chameleon* " which accompanies the description of this Acridian in his

* 1887, *J. Physiol.*, **8** : xxv, xxvi.

† 1893, *Proc. Roy. Soc.*, **54** : 417, pls. 3, 4.

‡ 1887, *Phil. Trans. Roy. Soc.*, **178**, B : 311. *Trans. Ent. Soc. Lond.*, **1892** : 293; **1903** : 311.

§ III Internat. Entom.-Kongr., Zürich, July, 1925, (Weimar, 1926,) **2** : 434–37.

catalogue probably implies that he recognised the existence of some power of individual colour-adjustment as necessary to explain the observed facts.

The resemblance of Acridians and other insects to the scorched and blackened vegetation caused by African grass-fires, observed by Sir Charles Martin, C.M.G., F.R.S., &c. (1912), C. F. M. Swynnerton, F.R.E.S. (1913), and Prof. G. D. Hale Carpenter, D.M., F.R.E.S. (1914, 1925), is fully recorded in the paper referred to above (pp. 438–450), where it is shown that the native custom of burning the grass in the dry season is probably of great antiquity (p. 439).

The contrast between 73 dark reddish-brown Acridians, taken 19 Aug. 1901, by my elder son and myself, on the red-brown soil of Heligoland, and the 80 pale sand-coloured, sometimes green-marked, examples of the same species, captured by us, the following day, on the Düne, a sand-bank with coarse grass, three-quarters of a mile away, led to the conclusion that " there is little doubt that these results, observed without a single exception in such large numbers, in two localities so near to each other, point to the conclusion that the species possesses the power of adjusting its colours to those of its normal surroundings, although these may differ widely from one another." *

The most beautiful example of adaptable protective resemblance hitherto observed in a European Acridian was exhibited to the Society on 1 November, 1933, by Mr. J. A. Simes, O.B.E., F.R.E.S., viz. *Oedipoda germanica*, Charp.—red on porphyry rock at Agay in the Estérel Mountains, grey like the limestone of the neighbouring foothills (*Proceedings* of 1 November, 1933).

Entomology and Human Life.

In the concluding section of this address I trust that one who has been a Fellow for half a century may be excused for dwelling upon personal experiences. To do so is almost inevitable when the subject to be treated is the study of natural history —and here especially the study of insects—in its relation to human life. There is an aspect of this relationship—a most beneficent aspect—which had not occurred to me until recently, indeed not until the preparation of this address became urgent. It is an inspiring thought that the study promoted by our Society is one which remains ever fresh, nay becomes more and more appealing with advancing years. I have recorded elsewhere † words spoken by John Blackwall in 1879 :—

" Discussing with considerable scepticism the belief that the bite of certain spiders was poisonous to man, Blackwall told me that he had often received monstrous tropical species with the most sinister reputation, and I clearly recall his pathetic tone of disappointment as he said :

" ' They might have had cheek or lip, but not one of them would bite me ! '

" Had not my interests been already fixed, here was enthusiasm at the age of 89, which might well have persuaded me to be an arachnologist."

A more recent experience showed the power of a scientific interest—in this instance the study of insects—to enable a naturalist to live happily in his work and waste neither time nor thought in lamenting the material losses and discomforts caused by the war.

* III Internat. Entom.-Kongr., Zürich, July, 1925, (Weimar, 1926,) 2 : 437, 438.
† *Proc. Roy. Soc.*, 1920, pp. li, lii.

Another memory is of a very different kind and I well remember the surprise felt when a distinguished scientific friend, who was looking forward to retirement and a place in the country, replied to congratulations on the prospect of giving the whole of his time to his own researches—" Well, I think one is entitled to rest at sixty." I fear that a comment suggesting that it might be preferable to end altogether was not entirely sympathetic.

No, the despairing cry—

" . . . Is there any peace
In ever climbing up the climbing wave ? "

is not for the scientific worker, least of all for the student of nature. It is otherwise with less fortunate lives. How often do we hear of hard-working men who are looking forward to a time of delightful leisure after retirement, and then enter upon the most unhappy period of life, mercifully shortened in many instances by a speedy death. Absorbing interests do not spring into existence ready-made just because a man wants them. But the naturalist need have no such fear : his interests will never desert him, but, so long as his mental faculties endure, will be always with him, growing with his growth. But this cheering thought raises the insistent doubt—Can we hope that the faculties necessary for the life and happiness of the naturalist *will* endure ? I believe that we can and that their exercise helps them to endure and even in some respects to grow.

I have been told that when Francis Galton was asked by a friend whether he was well, the old man would clasp his neck with both hands and say—" I'm all right as far down as this." And how true a conception ! For what is the body but a servant of the brain with its sense-organs—a servant attending to all its various wants and an internal combustion engine to carry it about, easily replaced, too, by another less attractive form of locomotive apparatus.

I venture to think that Matthew Arnold's lovely, pathetic lines on old age, in " Thyrsis " are altogether too mournful and depressing.

" . . . The brown hair sprent with gray "

often appears before middle age and is to be welcomed in many careers—a comfortable asset for the doctor, lawyer and salesman, most reassuring in its effect upon patient, client and purchaser.

And as for—

" The heart less bounding at emotion new,
And hope, once crushed, less quick to spring again,"

I am sure that the longed-for message from a friend that he had actually observed a male Danaine butterfly performing its toilet and inserting its brushes into the hind-wing scent-pockets, would produce a feeling of exaltation increased rather than diminished by the long years of expectation unfulfilled.

One loss must be admitted—that of memory, but it is a comforting thought that the unimportant things are the first to go. A name is forgotten when the man himself is remembered—recognised when seen from behind, recognised by his walk, or by some peculiarity of attitude or movement. One memory which meant life or death to our primitive ancestors is retained while another which was a convenience but of no real importance is lost.

Granting the failure of memory, how far is it accompanied by a diminution in imagination, in the power of making the leap from the known to the unknown? Matthew Arnold certainly expresses a sense of this loss in the lines :—

> " And long the way appears, which seemed so short
> To the unpractised eye of sanguine youth;
> And high the mountain-tops, in cloudy air,
> The mountain-tops where is the throne of Truth,
> Tops in life's morning sun so bright and bare."

I venture to believe that this contrast between imagination in youth and age has not been my own experience. More than 47 years ago I made some observations on " The softening of the contact between a Geometer larva and the twig on which it is resting " *—observations prompted by the following note published by my dear friend the late Prof. Raphael Meldola, in his translation of August Weismann's " Essay on the Markings of Caterpillars " † :—" The adaptive resemblance is considerably enhanced in *Catocala* and in *Lasiocampa quercifolia* by the row of fleshy protuberances along the sides of these caterpillars, which enables them to rest on the tree-trunks by day without casting a sharp shadow." This interpretation, subsequently accepted by Sir John Lubbock and Peter Cameron,‡ I found to be strongly confirmed by the existence of such fleshy protuberances at the one part in the body of a Geometrid larva at which there is the necessity for maintaining apparent continuity with the food-plant—and at this part only, viz. " at and between the two posterior pairs of claspers." Now although the fleshy processes largely obliterate the revealing cleft between the body of the larva and the bark, " a considerable furrow remains, but this is not apparent because of the light colour of the fleshy processes, which prevent the attention from being directed to the shadow which would otherwise indicate the position of the groove. The processes therefore attain the object of softening the contact between the larva and its food-plant in a twofold manner, by partially filling up the cleft, and by neutralising the shadow in the groove which remains."

But what a failure of the imagination not to realise that here was the meaning of the light colour at the contact between almost any living body and the earth—the meaning of the white undersides of animals.

And the failure is all the more astonishing because, two years later, the flat and leaf-like appearance of the chrysalis of the Purple Emperor butterfly (*Apatura iris*) was seen to be brought about by the same principle; and explained in greater detail.§ In precisely those parts of the pupa, " where the obvious thickness would destroy the resemblance to a leaf, the whole effect of the roundness is neutralised by the increased *lightness* . . . —a lightness which is so disposed as to just compensate || for the shadow by which alone we judge of the roundness of small objects (much larger objects can be judged of by the change of focus, which becomes necessary as their near or distant parts are observed ¶). In shading the drawing of an object so as to represent roundness, the shade is made to become

* " Notes in 1886 upon lepidopterous larvae, &c." : *Trans. Ent. Soc. Lond.*, **1887** : 292–4.
† *Studies in the Theory of Descent*, Engl. transl. by Meldola, Lond. 1882, p. 292.
‡ *Trans. Ent. Soc. Lond.*, **1878** : 242; **1880** : 75, respectively.
§ *Trans. Ent. Soc. Lond.*, **1888** : 595–7. || Please pardon the split infinitive !
¶ This method of judging depth was pointed out to me by my old friend the late Prof. R. B. Clifton.

gradually less and less deep as the tangential planes represented come nearer and nearer to a right angle with the axis of vision. So here, the converse of shading,—the whiteness neutralising the shadow which shading is intended to represent,—dies off gradually as the midrib is approached.

"The whiteness is produced by the relative abundance of white dots and a fine white marbling of the surface which is present everywhere, mingled with the green. The effect is, in fact, produced by a process exactly analogous to stippling.

"By this beautiful and simple method a pupa, which is 8·5 mm. from side to side in its thickest part, appears flat, and offers the most remarkable resemblance to a leaf which is a small fraction of 1 mm. in thickness."

These passages are quoted in full because they clearly show the failure to take a step which now seems so obvious. My old friend Osbert Salvin once told me of Huxley's words when Alfred Newton went to examine a mysterious box labelled "Penguins' eggs" in the museum of the Royal College of Surgeons and found that it contained ten eggs of the Great Auk—"Why you're like Saul, the son of Kish, who went out to seek his father's asses and found a Kingdom!" Surely, if these rare and precious eggs are to be compared with a Kingdom, the meaning of the white undersides of animals should be represented by an Empire—the Empire *not* found by a young man who sought to understand the devices by which a caterpillar and a chrysalis are hidden from their enemies—not found as it would have been by a more alert and wide-ranging imagination.

Would he have made the discovery later on? Probably not, but we can never know for certain because it was made and published in 1896 * by the American artist, the late Abbot H. Thayer, who became a dear friend and told me how the solution had come to him. In his experience as an artist he had found that it was nearly always impossible to paint a wild animal in its natural surroundings as an arresting feature in the composition, and when this *was* achieved it was by posing it silhouetted against the sky or in some other exceptional position. He was thus led to study a great variety of animals and finally reached his great conclusion that their colouring—darkest on the back, becoming gradually lighter on the sides and passing into white on the belly—obliterates the appearance of solidity, which is due to shadow. A colour-harmony also essential for concealment follows because the back, of the same tint as the earth bathed in the cold blue-white of the sky, resembles the under surface with its cold blue-white bathed in shadow and yellow earth reflections. Thus, as Thayer pointed out, the body of an animal disappears while its markings representing dead leaves, upright stems, &c. are alone distinctly seen. For ages the artist has produced the appearance of solid objects standing out on his canvas, by painting in the likeness of shadows. It remained for this great artist-naturalist to realise the logical antithesis, and to show that solid objects may fade away and become ghost-like or even invisible by painting out the shadows.†

I trust you will excuse a second personal experience which, having been recorded ‡ comparatively recently, requires only brief mention. Nearly forty-seven

* 1896, *The Auk*, **13** : 124, 318.

† The statement on pp. 299, 300 of "Essays on Evolution," Oxford, 1908, has been reproduced slightly modified and shortened in the above paragraph.

‡ 1927, *Proc. Ent. Soc. Lond.*, **2** : 75–82.

years ago I observed,* to my surprise, that the males of the Saturniid moth *Aglia tau*, L., well known to seek the virgin female from considerable distances, rarely paid any attention to them when bred in the same cage. The same apparently strange and unnatural behaviour was observed from time to time in the bred males of other moths, also known to " assemble " in the wild state, but the meaning was a mystery and even remained so in 1922 when my friend Dr. Eltringham experimented with the " Oak Eggar," *Lasiocampa quercus*, L., and found that a single bred male which had escaped and flown about in a greenhouse was ready to pair, while all the others neglected the females and dispersed when liberated, as described in our *Proceedings*, 2 : 76. The absurdly simple interpretation of the behaviour suddenly occurred to me an hour or two after a meeting of the O.U. Entomological Society, where the subject was discussed, in the Autumn Term of 1927. If the freshly bred males responded to the stimulus and at once " assembled " and paired, the result would be extensive in-breeding; for the female parents, being heavy and slow-flying, do not distribute their eggs far and wide, and the pupae of the whole family are scattered over a very limited area. But the freshly emerged males are incapable of responding to the epigamic stimulus and only become susceptible to it when their powerful flight † has carried them far away from the family domain.

It does seem extraordinary that such a simple explanation did not suggest itself at once, but it has been the same with other simple explanations. Thus, to compare a very great thought with a very small one, we may remember Huxley's words on Natural Selection—" My reflection, when I first made myself master of the central idea of the ' Origin ' was, ' How extremely stupid not to have thought of that ! ' " ‡

I remember when preparing for Classical Moderations—an examination no longer taken by science men but one which taught me far more than the grammar and the attempts to write bad Latin prose in Responsions—the " Heaven-sent precept ' Know thyself,' a maxim you must imprint and ponder over in your unforgetting heart,"—the special advantages of this knowledge, as stated by Juvenal, sound rather quaint but are certainly very wise—" whether you seek a wife or a place in the august Senate." §

What a man can remember of his own work must inevitably seem more to him than to others, but I hope that the memories I have ventured to bring before you to-night do lead to the belief that the happiness which springs from the observation

* *Trans. Ent. Soc. Lond.*, **1888** : 555.

† It would be interesting to observe whether this first flight is different in character from the epigamic flight so well known in the males of " assembling " moths.

‡ *Life and Letters of Charles Darwin*, Lond., 1887, **II** : 197.

§ Juvenal, xi : lines 27–30 :—

" . . . E caelo descendit *γνῶθι σεαυτόν*,
Figendum et memori tractandum pectore, sive
Conjugium quaeras vel sacri in parte Senatus
Esse velis. . . ."

The Greek motto was inscribed in the Temple of Delphi and was variously ascribed to one or another of the Seven Sages.

A brother-Fellow of my College, Mr. C. J. Fordyce, M.A., has kindly given me the reference which I had forgotten, and the translation. He has also reminded me of another quaint but very practical reason for a man knowing his own measure and observing it " in things both great and small, even when it is a fish that is being bought, so that you may not set your heart on a mullet when your purse can only afford a gudgeon " (xi : lines 35–38).

and study of insects is life-long and increases with accumulating experience. I am well aware, and rejoice in the fact, that this is also true of scientific and literary studies generally, but I believe it to be especially true of sciences like Entomology which bring their followers into frequent contact with living nature and with kindred minds.

APPENDIX.

Abstract of Dr. H. N. Kluijver's list of 17,933 prey contained in 1112 food samples collected by the neck-ring method in 1929, 1930, and 1931, from young starlings in a locality near Wageningen, Holland. The prey collected from young of the first brood is recorded in a column for each of the three years, as also that collected from " later and second brood " (verv. en 2e br.).

Omitting further mention of the 165 worms, 347 Gasteropoda, 71 Isopod Crustacea, 8 Myriopoda, 802 Arachnoidea, 4 Amphibia, 1 Reptile, 16 plants, and 35 mineral substances, the 16,484 Insecta (imagines unless otherwise stated), may be summarised as follows :—

ORTHOPTERA.—765 (1st br.,* 15 only), including 565 *Stenobothrus viridulus*, L., 167 *Mecostethus grossus*, L., 28 *Xiphidium dorsale*, Latr., and 5 specimens representing 4 species. The three above-named species were given as larvae and imagines, and 1 *Decticus verrucivorus*, L., as a larva.

DERMAPTERA.—2 *Forficula auricularia*, L., 1st br.—1 in 1930, 2nd br.—1 in 1931.

EPHEMEROPTERA.—1 ?*Cloeon dipterum*, L., 1st br.

ODONATA.—1 *Brachytron hafniense*, Müll., 1st br.

HEMIPTERA.—17 (1st br., 5 only), including 10 specimens (2 larvae) representing 4 species of Heteroptera and 7 representing 3 of Homoptera.

NEUROPTERA.—2 *Sialis lutaria*, L., 1st br.

TRICHOPTERA.—3 (1st br., 1), 1 each of 3 species.

LEPIDOPTERA.—3307, including 113 undetermined larvae, pupae and imagines. The butterflies are :—undetermined—2, *Argynnis aglaia*, L.;—6; *Vanessa urticae*, L.,—56 larvae and pupae; *Epinephile jurtina*, L.,—160, all stages; *Coenonympha pamphilus*, L.,—8; *Hesperia sylvanus*, F.,—1. Of the moths the chief were *Crambus* sp. (larv., imag.)—312; Noctuidae indet. (3 stages)—202; *Charaeas graminis*, L., with *Neuronia popularis*, F., (larv.)—613; *Hadena monoglypha*, Hfn., (larv.)—992; *Hadena secalis*, L., (larv., imag.)—85; *Agrotis* [*Tryphaena*] *pronuba*, L.,—43 (2nd br.); *Stilpnotia salicis*, L., (3 stages)—596 † (1st br., 11).

Interesting records among the small numbers are—*Cossus cossus*, L., (larv.)—1; *Zygaena filipendulae*, L.,—1; *Amphidasis betularius*, L.,—1; *Euchelia jacobaeae*, L., —2; *Spilosoma* sp. (larv.)—6; *Spilosoma menthastri*, Esp.,—2; *Agrotis c-nigrum*, L.,—1; *A. rubi*, V.,—18; *A. plecta*, L.,—1; *A. exclamationis*, L.,—18; *Plusia gamma*, L.,—7.

COLEOPTERA.—4490, including 14 indet. larv., imag. CARABIDAE—48 indet. larv.; 24 species, including *Poecilus cupreus*, L.,—114; *Pterostichus vulgaris*, L.,—

* The author's " 1st brood " is thus contracted and his " later and 2nd brood " is, for the sake of brevity, printed as " 2nd br.," but this must be understood to mean, the author kindly informs me, those 1st broods which are later than usual as well as second broods.

† This species was abundant on the poplars in June 1930 and the larvae and pupae as well as the flying and resting imagines were often captured by the starlings.

138; *Leistus* sp.—1 larv.; *Nebria* sp.—7 larv. DYTISCIDAE—5 sp. (13 specimens) including 4 larv. *Dytiscus* sp. STAPHILINIDAE—15 sp. (80 specimens). CLAVICORNIA—16 sp., including 11 specimens of 5 SILPHIDAE (1 larv. of *S. obscura*); 6 of 3 sp. *Hister*; *Coccinella bipunctata*, L.,—1; *C. conglobata*—1. SCARABAEIDAE—13 sp., including 22 larv. *Anomala aenea*, De G. The largest numbers were *Aphodius fossor*, L.,—87; *Hoplia philanthus*, Füssl.,—76. ELATERIDAE—14 sp., including indet.—1. The largest numbers—*Limonius pilosus*, Leske,—69; *Agriotes sputator*, L.,—161. MALACODERMIDAE—9 sp., the full numbers, as follows:—*Dascillus cervinus*, L.,—1; *Telephorus pallidus*, Goeze,—1; *T. lividus*, L.,—2; *T. fuscus*, L.,—1392 (1st br., 1929—950, 1930—145; 1931—225; 2nd br., 1929—6, 1930—60, 1931—6); *T. bicolor*, Herbst.,—2; *T. fulvicollis*, F.,—228 (1st br.—4); *T. nigricans*, Müll.,—1; *T. rufus*, L.,—182 (2nd br.—61); *Malachius marginellus*, F.,—1. LONGICORNIA—6 specimens among 5 sp. (1st br., 1). PHYTOPHAGA—5 sp., the complete record, as follows:—*Agelastica alni*, L.,—1; *Galeruca rustica*, Schall., (larv., imag.)—1323 (1st br., 1929—186, 1930—79; 2nd br., 1929—906, 1930—150, 1931—2); *Cassida rubiginosa*, Müll.,—1; *C. vibex*, L.,—1; *C. sanguinolenta*, Müll.,—1. CURCULIONIDAE—23 sp., including indet., all stages—14. Only 54 specimens of the 22 species, the largest number being 12 *Phylopedon plagiatum*, Schall., while 14 species are represented by single examples.

HYMENOPTERA.—799, including 1 indet. TENTHREDINIDAE—292, including 271 indet. larv. (2nd br., 1930—269) and 21 specimens of 6 sp., the largest being 13 *Tenthredopsis campestris*, L., (1st br.). ICHNEUMONIDAE—9, including 2 indet. and 7 named species—single records. BRACONIDAE—1 indet. HETEROGYNA—495, all but 7 from 2nd br. The important numbers are *Lasius* sp.—59 pup.,* *Lasius flavus*, De G.—333 pup., imag.; *L. niger*, L.,—36 pup., imag.; *L. alienus*, F.,—33; *Myrmica scabrinodis*, Nyl.,—22 pup., imag.; 6 other species of ant—12, largest number being 4 *Tetramorium caespitum*, L. FOSSORES—1 *Crabro cribrarius*, L.

DIPTERA.—7097, including indet. (chiefly all stages):—Dipt.—27, Tipulidae—56, Tabanidae—3, Asilidae—1, Syrphidae—3, Muscidae s.l.—170. The chief numbers are:—*Tipula paludosa*, Mgn.,—1693 larv. (2nd br.—219); *T. vernalis*, Mgn.,—286 (1st br.); *Pachyrrhina maculata*, Mgn.,—283 (1st br.—282); *Dilophus vulgaris*, Mgn.,—223 (1st br.); *Beris vallata*, Forst.,—118 (1st br., 1929); *Chrysomyia formosa*, Scop.,—152 (2nd br.); *Rhagio* [*Leptis*] *scolopaceus*, L.,†—2276 (1st br., 1929—1610, 1930—35, 1931—38; 2nd br., 1929—271, 1930—171, 1931—151); *Tabanus bovinus*, Loew.,—90 (3 stages); *Chrysozona* [*Haematopota*] *pluvialis*, L.,—493 (1st br.—8); *Empis* sp.,—175 (2nd br., 1929—102); *Scopeuma* [*Scatophaga*] *stercoraria*, L.,—852 (2nd br.—50). In addition to the above were small numbers, 22 *Dolichopus* sp. being the largest, of many other species including 22 represented by single specimens.

A summary of the methods and results of this most interesting research is given in English on pp. 137–139. The biology and ecology of the Starling were studied

* The author informs me that the large numbers of *Lasius* species were chiefly made up by the pupae which could generally be determined by the workers accompanying them. He is sure that the starlings were attracted to the nests by the presence of pupae and that the workers were only picked up occasionally.

† This fly was especially abundant in 1929, the starlings continually flying up from the ground to catch them on the wing.

in two colonies breeding in nest-boxes near Wageningen, Holland. The territory of the chief Colony, A, consisting of 17 nests in 1930, occupied about 62 acres ("± 25 ha"), but in 1931, with 28 nests, covered about twice this area ("± 50 ha").

In February, March and April the birds fed in a flock on fields near the boxes, and roosted for the night with thousands of others, in the reeds of a pool 5 km. distant.

The young were fed by both sexes but more often by the females. Feeding began at sunrise and ended during the first days at sunset, but later an hour before sunset. The young were fed many times per hour in the morning, much less frequently in the afternoon.

"In a nest with two young ones of 6 to 7 days old an average number of 112 feedings per day per young one was brought in by the parents; in a nest with six young ones this number was 65. The number of feedings per day in a nest with six young ones, being 118 on the first day, gradually rose to 350 on the eighth day. . . . Once 525 feedings were brought in on one day." During the whole period of feeding, food was brought 6895 times to one nest and 7668 times to another. The quantity of food eaten by a young bird daily amounted at first to half its own weight, later to six-sevenths.

At first the faeces were excreted and removed by the parents immediately after feeding, but sometimes they were swallowed by the female. Later, they were ejected from the entrance to the nest by the young. An excessive quantity of *Tipula*-larvae frequently caused fluid excreta which, in deep boxes, tended to accumulate and often to cause the death of the young.

"To determine the food of the young quantitatively a close fitting collar of aluminium was placed round their necks, so that they could not swallow the food that was brought in by the old birds." The young could wear these collars without harm for 4 hours a day, but when accurate results were to be obtained it was necessary to remove the food from the oesophagus, with forceps, directly after the departure of the old birds.

"For the greater part the food is collected on the ground. . . . In trees and in the air the food is only collected when great quantities of food are to be found there." Table IX on p. 79 does not entirely support these conclusions, at least so far as the air is concerned, for in the years 1929, 1930, 1931 the following percentages are recorded as collected in the air for the first broods—47·5, 23, 35, and for the later and second broods—29, 24, 24.* The corresponding percentages collected in trees are given as 0·5, 1, 1, and 4, 21, 7.

The author concludes that "It has been shown that the starling does not hunt a special insect-species, but that it usually catches what it can get easiest with its instinctive hunting-method."

It is pointed out on pp. 4, 5 that the invaluable list of prey, summarised on pp. 14, 15, provides negative evidence that certain insects are avoided—evidence which may be accepted as conclusive when the number of the records and the extent of the territory are taken into account.

* The author has kindly called my attention to the words at the bottom of p. 78, explaining that the figures for captures in the air are somewhat too high, inasmuch as all imagines of Diptera and Lepidoptera were placed in this category. A few of these were, however, taken directly after emergence and some at rest, as, for example, the moth *Stilpnotia salicis* (p. 14, note †).

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TO THE

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ERRATA.

Page 103, line 11, for *Schistostege decussata* **read** *Eupithecia venosata.*
Page 103, line 14, for *Thalera fimbrialis* **read** *Hemithea aestivaria.*

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